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ABSTRACT

A study analyzed the relationship between foreign language learning and four variables, including: nonverbal intelligence, conceptual level, mother tongue, and mathematics. The aim of the study was to investigate whether the same mental processes are involved in poor and good language learning, regardless of the learner's mother tongue. The study was carried out in Finland (with Swedish and English as foreign languages) and India (with English as a foreign language). Subjects were 600 Finnish and 168 Indian children aged 12-13. Tests of foreign language comprehension and production, a test of analytical and inductive reasoning, and a paragraph completion test for conceptual level were administered. School grades in foreign and native languages and in mathematics were also analyzed. Analysis indicates that three subgroups of varying nonverbal ability (low, average, high) differed significantly on comprehension and production, and similarly, three subgroups of conceptual level differed on these variables. In addition, it is concluded that there is a positive correlation between nonverbal intelligence and foreign language learning under normal school conditions, regardless of native language, the language taught, or cultural background. Findings suggest a parallel between the processes required for inductive reasoning and for foreign language learning. (MSE)

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RESEARCH BULLETIN 73

Irene Kristiansen

NONVERBAL INTELLIGENCE AND FOREIGN LANGUAGE LEARNING

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ABSTRACT

The main objective of the research was to study and analyze the relationship between foreign language learning and (a) nonverbal intelligence, (b) conceptual level, (c) mother tongue and (d) mathematics. In the study foreign language refers to any non-native language that is learnt after the primary language. The aim was to investigate whether the same mental processes are involved in poor and good language learning regardless of the learners' mother tongue. The study was carried out in Finland and in India. As foreign languages English and Swedish were chosen in Finland, English in India. The FL studied was not closely related to the mother tongue.

The total sample consisted of 768 pupils, 600 from Finland, and 168 from India, age group 12-13 years. The tests given to the subjects were: (a) foreign language test, (b) Raven's Progressive Matrices test (1983), and (c) Hunt's Paragraph Completion Method tes: (1977). Hunt's test was used to assess the conceptual level. The foreign language test consisted of two main parts: comprehension and production. The reliability and validity of the test were found to be satisfactory. The school grades of the pupils were taken on foreign language, mother tongue and mathematics.

The statistical analysis of the data was carried out using ANOVA, t-test, correlations and regression analysis. Three subgroups of varying nonverbal intelligence (low, average and high) were generated on the basis of Mean ± one Standard Deviation. The results showed that the three subgroups differed significantly from each other both on their comprehension and production scores. Similarly, three subgroups of varying conceptual level differed significantly from each other on their comprehension and production scores. The findings apply both to the Finnish and the Indian sample. In the Finnish sample the girls showed significantly higher nonverbal intelligence and conceptual level.

Multiple regression analysis applied to the Finnish sample showed that nonverbal intelligence accounted for 15 % of variance in comprehension scores and 44 % in production scores. Mother tongue contributed significantly towards production. The contribution of conceptual level towards both comprehension and production was also significant, although low. Multiple regression analysis applied to the Indian sample showed that nonverbal intelligence accounted for 8 % of variance in comprehension scores and 51 % in production scores. Mother tongue contributed significantly only towards comprehension, 43.50%. Conceptual level contributed significantly only towards production. The contribution of mathematics was significant towards both comprehension and production in the Indian sample, but not in the Finnish sample. The results show a greater role of nonverbal intelligence in production than in comprehension.

A conclusion was drawn that there is a connection between nonverbal intelligence and foreign language learning under usual school conditions. This seems to be true independently of the learner's mother tongue, the language taught, and cultural background, as it comes out clearly both in the Indian and the Finnish sample, and for both sexes. The findings suggest that the different processes involved in solving problems on the Raven's test, i.e., analytical and inductive reasoning, are to a certain degree parallel to the processes required in learning a foreign language. Sex differences and differences between the Indian and the Finnish sample are discussed but require further research.

Key words: foreign/second language learning, nonverbal intelligence, inductive and analytical reasoning, conceptual level

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PREFACE

The present study originated from the fact that all pupils in Finland are required to study two foreign languages, both of them very different from the Finnish language. In spite of great efforts both on the pupils' and the teachers' part some pupils learn very little indeed, in fact next to nothing. In practically all classes one can probably find pupils who are unable to make themselves understood in the foreign language, or even to understand what their classmates and the teacher are talking about.

It is reasonable to assume that the nonlearning of foreign language is not a problem in Finland only. The idea to extend the research project to another country was therefore logical. It would be fairly easy to choose another Nordic country, like Norway or Sweden. Then one could compare the Finnish sample with a sample in which the pupils studied a language (English) closely related to their own. In spite of practical problems, however, the investigator decided on India. This decision was taken for two reasons: Indian languages are very unlike English, and the cultural background of Indian children could be supposed to be rather different from that of Finnish children. If in spite of this it proved possible to find common factors for nonlearning, one could assume to be on the right track. Not much research is available in the area of poor foreign language learning outcome. We still know very little about mental processes behind good and poor language learning.

The present study is concerned with children attending ordinary school classes, children who have been considered to meet the requirements of general intelligence.

Doctoral Dissertation
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The present research project would hardly have been undertaken at all unless Professor A-L. Leino, University of Helsinki, had given me so much encouragement from the start. Therefore, it goes almost without saying that I am deeply grateful to her.

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I am also very much indebted to Associate Professor Sunil Dutt Gaur, Zakir Husain College, University of Delhi. Dr. Gaur has given critical and creative comments during my work with the manuscript, and he and his family have given me all sorts of practical help and assistance.

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It is impossible to name all the headmasters and teachers both in India and Finland who have given me all the assistance I have asked for. Let them be assured that I am deeply grateful, and of course I am also grateful to the pupils, who have so patiently and conscientiously taken all the tests.

In Norway my husband, Eivind Kristiansen, has supported me by patiently reading the different versions of the manuscript, improving the language and suggesting changes. I am also very grateful for all his practical assistance.

Irene Kristiansen

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CHAPTER 1

THEORETICAL BACKGROUND

1.1. Background and Purpose of the Study

The present investigation has been inspired by the fact that there are countries where all children at elementary school level have to study not only one but two or more languages as compulsory subjects. To learn languages related to one's mother tongue should not be considered too difficult a task. But what happens if the languages to be studied are completely different from the pupil's mother tongue? Will all children succeed in learning two or three languages in addition to all the other theoretical subjects? This does not seem to be the case. On the other hand, there are children who are doing extremely well also when studying four languages.

In many countries, for instance Sweden, Norway and Finland, there have been different kinds of streaming systems. At present the situation in Sweden and Norway is that the pupils have to study one foreign language as a compulsory subject, i.e., English. In Sweden, e.g., the differences between those performing well and those performing poorly have been found to be so big that after some years of studies the poorest performers are not able to comprehend very much of the teaching, while, on the other hand, the best performers could learn a lot more (information from the National Board of Education, Stockholm).

The situation in Finland is quite different. All children have to study at least two languages in addition to their mother tongue. The school curriculum in Finland requires that all children start studying a second language in grade 3, at the age of 8 - 9, and still another language in grade 7, at the age of 12 - 13. One of these languages has to be Swedish, which is the second official language in

the country. The other language is usually English. Neither of them is related to Finnish.

Another country, where lots of elementary school children have to study two, three or even four languages, is India. This applies for instance to children going to central government schools. They are schools where the children come from relatively similar backgrounds. In these schools children start learning English, Hindi, and/or their local language from the very beginning (grade 1, age 5). Later, in grade 5, also Sanskrit is introduced as a compulsory subject. English, Hindi and Sanskrit are studied by all children.

It is, however, to be noticed that what has been said above only applies to children attending central schools in India. If we compare the whole school system in India and Finland, there are many differences. In Finland all children receive education, mostly in comprehensive schools. The conditions in schools as well as the teaching standard do not differ greatly. In India school is compulsory for all children, yet it is well known that many children never even start school. In the poorest areas there are lots of children who go to school for only a few years. On the other hand there are children who go to school from the age of 4 till they are 17 - 18. In addition, school days can be very long and the amount of homework considerable.

Research on poor foreign language learning outcome is scarce. We still know very little about mental processes behind good and poor foreign language learning.

Foreign language learning is always also language learning. Therefore it can be assumed to be connected with a person's verbal intelligence. Thus it would be interesting to study poor performers' verbal intelligence, or general intelligence for that matter. For remedial purposes, however, it is not of great value to find out that a pupil who is poor in foreign language learning is also poorer than his classmates in verbal intelligence. This would only be what is to be expected.

The main purpose of the present research is to study and analyze the relationship between nonverbal intelligence and foreign language learning, what factors in so called nonverbal intelligence are related to foreign language learning. The study is concerned with children attending ordinary school classes, children who have been considered to meet the requirements of general intelligence.

The interest of the present study is in children studying foreign languages, completely different from their mother tongue, as compulsory subjects at elementary school level. For this reason children from comprehensive schools in Finland and central schools in India were chosen for the investigation.

In this study 'a foreign language' refers to any non-native language that is learnt after the primary language. Because the present investigation is concerned with children learning foreign languages at school, the term 'learning' is generally used instead of 'acquisition'. Many scholars use the term 'second language acquisition' when language learning goes on primarily among speakers of that language in the learner's everyday surroundings. The distinction is a useful one, although the processes behind 'learning' on one side and 'acquisition' on the other have not been satisfactorily explicated.

1.2. The Role of Language in Communication

Language is supposed to be man's most efficient system of communicating. A language is a system of arbitrary vocal symbols which permits all people in a given culture, or other people who have learnt the language system of that culture, to communicate or to interact. Communication is achieved by emitting certain sounds or writing certain symbols that contain a particular meaning which a speaker (or a writer) wants to convey to a listener (or a reader). In other words, codes are used in order to convey a particular message. Essentially all languages are spoken or written in terms of codes (symbol or sound). If X conveys an idea to Y in a language which Y does not understand, it simply means that Y cannot decode the idea of X.

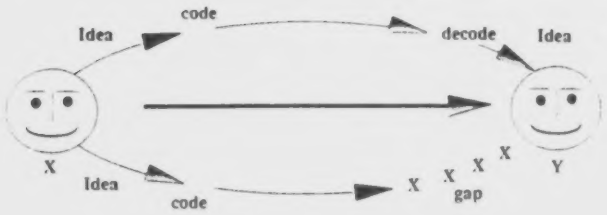

Figure 1. Language is a code

If Y, however, could understand the language (idea), it would mean that he could decode the language into the idea. There are thousands of languages in the world. In other words, an idea can be communicated in thousands of different codes. Unfortunately, it is not so easy to learn new codes, because they vary from country to country, culture to culture, society to society. For a person who is not familiar with another language system even most important words written in that language system would be just a few lines of nonsense words on a piece of paper. In order to make this nonsense meaningful one has to learn the system of the other language or at least part of it.

The same process could also be understood with the help of a communication model. Although at the beginning the model was applied to electrical systems, it can also be applied to studying the process of human communication.

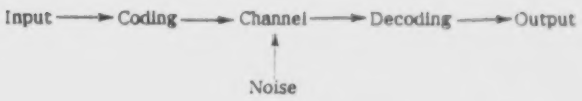

Figure 2. Communication model

In a classroom situation the teacher provides ideas, information, concepts, or some other subject matter as an input to code to the students. The students are expected to decode the ideas, information and concepts, and so on. Regardless of the source, contents, and direction of communication, language travels in the form of symbols. In a foreign language learning situation this means that the student must be able to understand at least the main content of what is said or written. In order to do this, he must know the meaning of at least the most important content words in the message. In messages with a complicated surface grammar also the deep grammar structure must be understood. Therefore it is of great importance in foreign language learning to study how well the students understand what they hear or read, and also whether it has any connection with understanding their own mother tongue in similar kinds of context.

1.3. Concepts and Language

Language learning aptitude has been defined in terms of abilities to manipulate symbols, sound discriminations, memory for speech sequences, etc. (Carroll 1963; Jakobovits 1970). A symbol stands for a class of objects or events with common properties, it refers to a concept. With the help of concepts we are able to order and classify our environment. Words (with the exception of proper names) represent concepts since they do not refer to a single object or event but a class. Psychological processes of generalization and discrimination are involved in learning concepts. For instance, when a child is learning the concept of 'dog', he may generalize the term initially to include all small animals. Gradually, through environmental feedback and trial and error, he may refine the concept further and distinguish among breeds. Human beings are able to deal with all sorts of concepts from such concrete ones as 'a cow' to highly abstract ones such as 'beauty', 'truth' and 'God'.

The account of language development provided by Taylor (1974) involves construction of a network of concepts and relationships between concepts by the learner. Taylor's theory of language development begins with the development of low-level concepts in the network. These are the simple concepts for various features of the environment, defined in sensory terms (lines, contours, colors,

etc.). A pattern in the environment will activate a network of such features. For example, the perception of an orange will involve the perception of a particular shape, color, and other features. Over a period of time, the recurrence of the given pattern of features comes to define a higher order concept, in this case 'orange'. Thus, a series of concepts is built up, forming a highly elaborate network of concepts. The building of higher order networks is not restricted to presentation of physical properties only. Relationships between physical objects can also emerge as stable recurrent patterns and thus gain the status of a concept in the network (e.g. relationships such as 'hit at', 'is father of', etc.). Taylor attempts to account for the acquisition of concepts that are important for language development in this way.

It can be said that because language learning involves concept formation to a great extent, it may in practice mean that if a child is poor in concept formation, he is likely to have difficulties in language learning.

1.4. Foreign Language Learning: Theories and Approaches

Research into foreign language learning is a comparatively new field. We do not yet know much about the development of comprehension and production skills, nor do we know a lot about the development of vocabulary. There is not much research done about the interactions between the pupils and the teacher. During the last decades, however, there have been serious attempts to improve the quality of foreign language learning, and theoretical principles have become more and more important. Both linguists and psychologists have started referring to general principles and theories concerning how languages are learnt, how knowledge of language is represented and organized in memory as well as how language itself is structured.

In describing theories, the difference between a philosophy of language teaching at the level of theory and a set of procedures for teaching a language is central. According to Anthony (1963), the term 'approach' refers to theories about the nature of language and language learning that serve as the source of practices and principles in language teaching. Thus 'approach' is the level at

which assumptions and beliefs about language learning are specified, and 'method' is the level at which theory is put into practice. According to Richards and Rodgers (1986) a learning theory underlying an approach or a method responds to two questions: (1) What are the psycholinguistic and cognitive processes involved in language learning? (2) What are the conditions that need to be met in order for these learning processes to be activated? Learning theories associated with a method at the level of approach may emphasize either one or both of these dimensions.

The Grammar-Translation Method

As 'modern' languages began to enter the curriculum of European schools in the eighteenth century, the same basic procedures were used as for teaching Latin. Textbooks consisted of statements of abstract grammar rules, lists of vocabulary, and sentences for translation. Speaking the foreign language was usually not a defined goal. This approach to foreign language teaching became known as the Grammar-Translation Method. It is a method for which there is no theory. According to Richards and Rodgers (1986, 2-5) there is no literature that offers a rationale or justification for it or that attempts to relate it to issues in linguistics, psychology, or educational theory. The method dominated foreign language teaching from the 1840s to the 1940s, however, and in modified forms it is still widely used in some parts of the world.

Emphasis Shifts to Spoken Language

The grammar-translation approach was not the only method used in foreign language teaching. As early as the midnineteenth century several factors contributed to questioning and rejection of the grammar-translation method. Increased opportunities for communication among Europeans created a demand for oral proficiency in foreign languages. Emphasis on spoken language is, however, nothing new. It has been estimated that about sixty percent of today's world population is multilingual (Richards and Rodgers 1986, 1). It can be said that throughout history foreign language learning has always been an important

practical concern. Yet it was probably neither widely studied nor considered theoretically before the nineteenth century.

Little by little new approaches to language teaching were developed, approaches that referred to children's learning their mother tongue as a model. The reformers in the late nineteenth century shared many beliefs about the principles on which a new approach to teaching foreign languages should be based. The reformers naturally differed considerably in the specific procedures they developed. In general it can be said that the reformers believed that:

1) the spoken language is primary,
2) the findings of phonetics should be applied to teaching,
3) learners should hear the language first,
4) words should be presented in sentences, and sentences should be practiced in meaningful contexts and not be taught as isolated, disconnected elements,
5) the rules of grammar should be taught only after the students have practiced the grammar points in context - that is, grammar should be taught inductively, and
6) translation should be avoided, although the mother tongue could be used in order to explain new words or to check comprehension (Richards and Rodgers 1986, 8).

These principles provided the theoretical foundation of language teaching and the study of language. They did not, however, result in any specific method, but they were involved in the assumption that foreign language learning is like first language acquisition and should be taught accordingly. All the above principles resulted in different kinds of Natural Approaches. The most famous of these came to be known as the Direct Method. The method was fairly popular in different countries for quite a long time. Gradually, however, it met a lot of criticism especially from psychologists and applied linguists. According to the method everything should have been taught without translation if the meaning could be conveyed directly through demonstration and action. The result was, however, not the ability to speak the language - as had been expected. Gradually, critics both in Europe and the USA showed that the method had several drawbacks. Reading and writing were deferred for months,

in some programs for years - for fear that the written symbols would harm the learners' pronunciation. Further, this procedure required teachers with nativelike fluency in the foreign language, or native teachers. For these reasons the method was little by little modified all over Europe, and even more in the United States. It was considered that the method offered innovations at the level of teaching procedures but lacked a thorough methodological basis. Especially American specialists came to the conclusion that it was impossible to teach conversation skills satisfactorily during the time available in schools. A study - published as the Coleman report - advocated that a more reasonable goal for foreign language teaching would be a reading knowledge. The emphasis on reading continued to characterize foreign language teaching in the USA until World War II.

The Audiolingual Habit Theory

A dramatic change in the need of knowing foreign languages was caused by the Second World War. When the United States entered the war, it had a significant effect on language teaching. The government commissioned American universities to develop foreign language programs for military personnel. The objective of the army programs was to give students a conversational proficiency in a variety of foreign languages. At the same time linguists and applied linguists became increasingly involved in the teaching of English as a foreign language. The principles of structural linguistics were applied to language teaching. Both structural drilling exercises and guided dialogues were included in the language courses for the army. This approach developed by linguists at Michigan and other American universities became known variously as the Oral Approach, the Aural-Oral Approach, and the Structural Approach. This was the system adopted by the army, and excellent results were often achieved: the students learnt to communicate in the foreign language concerned. The emergence of the Audiolingual Habit Theory resulted at least partly from these experiences adding insights taken from behaviorist psychology. This approach to language analysis appeared to offer the foundations for a scientific approach to language teaching. Language was viewed as a system of structurally related elements for the encoding of meaning, the elements being phonemes,

morphemes, words, structures, and sentence types. Learning a language, it was assumed, entails mastering the elements. An important aspect of structural linguistics was that the primary medium of language is oral: speech is language.

Supporters of audiolingualism could also rely on the work of the behaviorists. In 1957 Skinner, in his famous book on Verbal Behavior, elaborated a theory of learning applicable to language learning. According to him language is a habit formation, and thus we have no reason to assume that verbal behavior differs in any fundamental respect from nonverbal behavior, or that any new principles must be invoked to account for it.

The Skinnerian view of learning and language learning prevailed for decades, and is, in fact, still influential to a certain degree. In the late 1960s and thereafter it has, however, been seriously criticized both by applied linguists, psychologists, and educationalists.

The earliest heavy criticism was given by Rivers (1964). A detailed critical review is given by e.g. Carroll (1966, 1971); Chastain & Woerdehoff (1968); Jakobovits (1970); Chastain (1969, 1970, 1976), and Leino (1979). Later, audiolingualism has been heavily criticized by e.g. Hammerly (1982); Krashen & Terrell (1983), and Finocchiaro & Brumfit (1983). A much more balanced criticism has been given by Brown (1980), and Richards & Rodgers (1986).

The Cognitive Code-Learning Theory

Gradually the whole audiolingual paradigm with pattern practice through drilling was called into question, and a return to grammar-based instruction called the Cognitive Code-Learning Theory took place.

According to this theory learning a foreign language is a process of acquiring conscious control of the phonological, grammatical, and lexical patterns of the language, largely through study and analysis of these patterns as a body of knowledge (Carroll, 1966). The theory attaches more importance to the learner's understanding of the structure of the foreign language than to how he can use

that structure, since it is believed that provided the student has a proper degree of cognitive control over the structures of the language, facility will develop automatically with his use of the language in meaningful situations. The theory thus stresses conscious control of patterns through study and analysis, and could be called a modernized version of the old grammar-translation technique. Later Carroll (1971) connected this theory very closely with the audiolingual theory by saying that 'habit formation' can very well be 'cognitive habit formation' and the theory could thus be called 'the cognitive habit formation theory', or 'the cognitive audiolingual theory'. The main difference is proposed to be the addition of a 'communication practice' component. Also audiolingualism at its best, however, included communication.

The cognitive code-learning theory in foreign language learning can be said to rely on Ausubel's theory of cognitive learning and on Chomsky's transformational-generative grammar and his idea of creativism in language learning. On the one hand, the cognitive theory acknowledged the role of abstract mental processes in learning, and on the other hand, learners should be encouraged to use their innate and creative abilities to derive and make explicit the underlying grammatical rules of the language.

Communicative Approaches

Teaching language for communication is closely related to the functional aspects of language. An interest in them was first raised by linguists and sociolinguists. There is, however, no single one theory to explain communicative language teaching. Neither can it be considered any one single method. It is also closely related to the functional approach, originally developed in Great Britain. A functional approach to language is interested in performance, the actual use of language for communication. It is thus generally agreed that language teaching should be communicative and based on the functions of language use.

For foreign language teaching, the communicative approach has meant a shift of emphasis from grammar to the communicative functions of language. According to Littlewood (1981, 1), grammar is in no way neglected; instead, one

of the most characteristic features of communicative language teaching is that it pays systematic attention to the functional as well as the structural aspects of language, combining these two into a more fully communicative view. It may be claimed, however, that communicativeness is emphasized for grammar.

Wilkins is among the researchers whose work contributed most to the new kind of textbooks as well as curriculum development. His book Notional Syllabuses (1976) had a significant impact on the development of communicative language teaching. Wilkins's book had a strong influence on the design of communicative language programs. This kind of teaching is now referred to as communicative approach or communicative language teaching. The terms functional-notional approach and functional approach are also used. It is worth noting, however, that there is no universal agreement of what these concepts mean (see also Savignon & Berns, 1984). It might even be that this state of affairs has resulted in teaching materials that are neither functional nor communicative.

An early advocate of communicative foreign language teaching, Brumfit (1978), suggests that changes in methodology usually come from two main sources: changes in our attitudes to language (via linguistics, sociolinguistics, and psycholinguistics) and changes in the social demands made on language teaching as a result of changes in the economic and political roles of the languages concerned. As a consequence, connections between the language and its use in the world have become important. Foreign language learners should be taught as well as tested on an ability to interact with other people in particular situations. Such teaching and testing would lead to a better prediction of a person's communicative ability in a real-life situation than testing the knowledge of the target language system.

According to Brumfit, it is the above point of view that has changed our attitude to error. Errors illustrate stages in the process of learning. This does not mean that we hope that learners' errors will persist, but that they are not something that should be avoided and prevented at all costs. The traditional grammatical syllabus neglected the non-grammatical features of language and communication. A concern for maximally effective communication will again

lead back to work on accuracy, but to an accuracy that tolerates errors not seriously hindering communication.

Researchers in the communicative approach have analyzed the use of language in detail, but generally *disregarded theories of learning to a great extent*. As a consequence, they seldom offer concrete procedures for practice, or if they do, they do not base their views on learning theories. Also, there exists no agreement on how to proceed in practice. They seem to suppose, for example, that carrying out meaningful communicative tasks always promotes learning in the desired way. Yet the learning outcomes depend on how the communicative practice is performed.

Certain aspects in the communicative approach to foreign language teaching are of great importance. It gives more room to individual differences: learners can produce simple or complex language in the same communicative task. Secondly, the emphasis has shifted from grammatical accuracy to the conveyance of message. Thirdly, allowing individually different products is likely to increase motivation and interest in foreign language learning. Fourthly, communicative approach lends itself to various teaching techniques. Richards and Rodgers (1986) emphasize that communicative language teaching is also in harmony with a more humanistic approach to teaching, in which the interactive processes of communication receive priority. Two well known methods of foreign language teaching employing a communicative approach are Lozanov's Suggestopedia (see e.g. Lozanov 1978; Saferis 1978, 1986) and Prabhu's Bangalore/Madras Communicational Teaching Project based on problem solving through reasoning (1987).

The Variable Competence Theory

The Variable Competence Theory proposed by Ellis (1985, 266-70) deals with learner varieties. It is based on two distinctions: one refers to the process of language use, and the other to the product. It claims that the way a language is learnt is a reflection of the way it is used. In the process of language use one must distinguish between

1) linguistic knowledge (or rules), and
2) the ability to make use of this knowledge in discourse (procedures).

Procedures for actualizing knowledge are of two types: primary and secondary. Each set of processes has an external and internal representation, referred to as discourse and cognitive processes respectively. Primary processes are responsible for engaging in unplanned discourse. Secondary processes work in planned discourse. An example of a primary process is semantic simplification, and an example of a secondary process is monitoring, the editing of language performance. Discourse and cognitive processes employed are accounted for as follows (p. 268):

Discourse processes:
Simplify the semantic structure of a message by omitting meaning elements that are communicatively redundant or that can be realized by a nonverbal device (e.g. mime).

Cognitive processes:
a) Construct an underlying conceptual structure of a message.
b) Compare this structure with the frame of reference shared with an interlocutor.
c) Eliminate redundant elements and elements for which no lexical item is available.

Primary and secondary processes account for how second language learners actualize their linguistic knowledge in discourse. Thus they account for the variability of language-learner language by positing that different kinds of knowledge and different procedures are involved in the construction of different discourse types. They also account for acquisition in the following way:

Development occurs as a result of -
a) acquisition of new second language rules through participation in various types of discourse,
b) activation of second language rules so that they can be used in unplanned discourse (p. 269).

These proposals are shown in Figure 3.

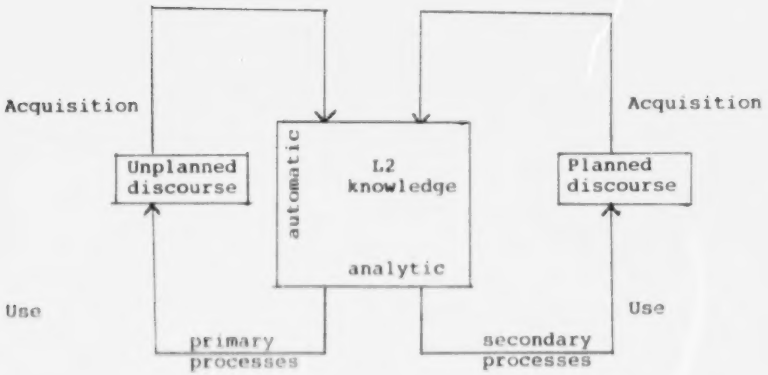

Figure 3. Variable Competence Model of Second Language Acquisition (Ellis 1985, 269)

When evaluating his theory Ellis points out that it needs to provide a more detailed analysis of the primary and secondary processes responsible for use and acquisition. Yet when developed further, the theory might prove to be of great value because it attempts to account for the variability of language-learner language and the external and internal processes responsible for foreign language learning.

Concluding Remarks

Foreign language learning is a process of enormous complexity, with a great variety of factors involved. Therefore, it is not surprising that there still exists no theory that offers a complete description of all aspects of the process of both learning and non-learning, not to mention an explanation.

There are several other theories and approaches than the ones presented here. None of them, however, seem to offer any more help when trying to understand factors behind different levels of the learning outcomes. The theories and approaches treated above were chosen because taken together they represent the development in the foreign language teaching. They show that the newer theories at least make serious attempts to answer the question presented by Richards and Rodgers (1986): "What are the psycholinguistic and cognitive processes involved in language learning?" At present the answer is, however, far from being clear. In addition, the other question presented by Richards and Rodgers: "What are the conditions that need to be met in order for these learning processes to be activated?" has been dealt with in detail by very few researchers. Among those who have tried to find an answer to the second question are e.g. Krashen et al. (Krashen 1978, 1981, 1982, 1985; Krashen & Terrell 1983; Dulay, Burt & Krashen 1984). They identified five general sources that may account for discrepancies between learners' speech output and the input learners receive: (1) language experience, (2) personality factors, (3) cognitive organizer, (4) monitor, and (5) socio-affective filter. 'Socio-affective' filter refers to the learner's unconscious needs, attitudes and motivations. 'Cognitive organizer' refers to the learner's basic cognitive processes, the strategies that systematically create certain kinds of errors. 'Monitoring' means conscious editing of one's own speech. There are, however, considerable difficulties in trying to find out what the different determinants really mean in practice. For instance, one of the main ideas lies in the use of the monitor. But how can a pupil poor in foreign language learning possibly monitor his speech if he does not know the correct grammar and if he in addition is very unsure about vocabulary? Although Krashen's theory based on his Monitor Model is among the models that have received most attention, it has been heavily

criticized from several aspects (see e.g. McLaughlin 1978, 1987; Gregg 1984; Takala 1984b).

There are several other approaches to foreign language learning. Their contribution to teaching foreign languages may prove to be considerable, yet at present their theoretical basis is not clearly enough accounted for in the literature available.

1.5. Language Aptitude

The exact nature of 'language aptitude' is not known. Therefore, it is not easy to define it. It is usually defined in terms of the tests that have been constructed to measure it. A language aptitude test is supposed to measure a person's general ability to learn a language. Aptitude tests are supposed to be independent of a particular language, predicting success in the acquisition of any language. Two well known test batteries of this kind are Carroll and Sapon's Modern Language Aptitude Test (1959) and Pimsleur's Language Aptitude Battery (1966). Pimsleur found that school children's average grades in all school subjects were often good means of predicting how good they would be at language learning. Therefore, he included these grades in his battery. On the whole, both the batteries include similar tests of language abilities. Those of Carroll and Sapon are given below:

1. the ability to identify and remember sounds,
2. the ability to memorize words,
3. the ability to recognize how words function grammatically in sentences,
4. the ability to induce grammatical rules from language examples.

It is of interest to note that language aptitude correlates best with reading and grammar tests (Genesee 1976). Of the four different tests mentioned above, tests 2, 3, and 4 measure more or less the same abilities as intelligence tests in general. It would be of interest to know to what extent language aptitude tests and intelligence tests really are measures of different abilities. At least parts 3 and 4 in Carroll and Sapon's battery to a great extent measure inductive

reasoning, which is required in e.g. Raven's test of nonverbal intelligence. According to Krashen and Terrell (1963, 40) having a high aptitude makes one a good learner but not necessarily a good acquirer.

It may well be that language aptitude batteries have not brought about very much new knowledge about foreign language learning, but have instead confirmed that intelligence tests and language aptitude tests to a great extent measure the ability in one's own mother tongue. Language aptitude batteries have been found to be more closely related to learning outcomes in formal foreign language learning than with communicative abilities (see Brown 1980; Gardner 1980; Littlewood 1984; Ellis 1985). If language aptitude batteries are poor predictors of interpersonal and communicative skills in a foreign language, then it must be concluded that an important aspect is neglected when employing these tests.

1.6. The Role of Motivation and Attitude in Foreign Language Learning

Motivation is generally considered to be an important factor in foreign language learning. One of the problems connected with motivation is, however, that there is no general agreement about what motivation really is.

In psychology a motive is often defined as the strength of a tendency to action (e.g. Birch and Veroff 1966; Vernon 1969). Atkinson (1964) adds to strength duration and direction of a certain behavior. Motivation is also commonly thought of as an inner drive, impulse, emotion, or desire that moves one to a particular action (e.g. Brown 1980, 1981). A number of factors can thus be included in motivation.

A great many psychological experiments comparing the effects of the level of motivation upon learning have been done, yet the picture that emerges from the results is by no means clear (see e.g. Atkinson 1964; Cofer & Appley 1964; Spence & Spence 1968; Ausubel 1968; Hulse, Deese & Egeth 1975). It can be concluded that there is some evidence which suggests that the level of

motivation will affect the amount learnt, but there are also experiments which show negative results (Hulse et al. 1975, 171).

According to McDonough (1981), in foreign language learning motivation one must distinguish at least between seven factors:

(1) energy,
(2) willingness to learn,
(3) perseverance,
(4) interest,
(5) enjoyment of lessons,
(6) incentives,
(7) benefits of knowing the language.

The sources of motivation may or may not be present in the classroom and, unfortunately, only a few types of motivational factors are under the teacher's control. Interest may be original to the student, but may also be related to parental encouragement or the teaching method, or the teacher's personality. It may also have been created by visits to foreign countries, or by friends, television programs, etc. The effectiveness of any activities in the foreign language classroom must to a great deal also depend on different learner characteristics, the learning situation, and the goals of the learner.

The strongest advocates for the importance of motivation are Gardner and Lambert and their associates (1959- 1985). According to their long-time studies strong motivation is significant for successful second language learning. They make a distinction between two different kinds of motivation: integrative and instrumental. A learner who possesses integrative motivation has a genuine interest in speakers of the target language and the language itself, while a learner with instrumental motivation is more interested in how the language can be useful in trying to attain other goals, such as e.g. getting better jobs later. This distinction is not, however, anything new, as the terms very closely correspond to 'intrinsic' and 'extrinsic' motivation in general learning theory. (For an opposing view, see Stevick 1976, 49.)

In the earliest studies Gardner and Lambert claimed that integrative motivation gave better results in second language learning. At this time they studied English-speaking learners of French in areas of North America where there are communities of French-speaking natives at hand. In these circumstances it was natural that they found integrative motivation to be of great importance in order to gain proficiency in the second language. These results were, however, challenged by e.g. Lukmani (1972), who studied learners of English in India and came to the opposite conclusion. It seems reasonable that these two kinds of motivation are not mutually exclusive, and sometimes it is artificial even to keep them separate. Also Gardner and Lambert later came to the same conclusion when studying learners of English in the Philippines. They found that instrumental motivation correlated best with the learners' success in foreign language studies. On the basis of this finding they re-evaluated their earlier findings and later maintain that strong motivation is necessary for successful second language learning, but the type of motivation will vary according to the cultural setting.

There are, however, different kinds of problems when measuring motivation. It can only be measured indirectly either by watching a learning situation, or on the basis of questionnaires and interviews. In addition, there is still no general agreement on what motivation in foreign language learning consists of. Most of the studies in different countries have been made *after* or *in the middle of courses* in foreign languages, or even after several years of studies in the target language. The conclusion generally made is that high motivation results in high achievement (e.g. Gardner & Lambert 1959, 1972; Lukmani 1972; Savignon 1972; Brown 1973; Gardner & Smythe 1975; Gardner, Ginsberg & Smythe 1975; Schumann 1975, 1976; Oller et al. 1977).

Jakobovits (1970) examined a number of studies in this field and found that motivation/perseverance accounted for about 33 % of the variance of foreign language achievement, the same amount as foreign language aptitude. Earlier Pimsleur, Mosberg and Morrison (1962) concluded on the basis of a similar survey that motivation accounted for only about half as much as Jakobovits found. All researchers do not, however, consider the relationship between motivation and achievement to point in this direction. For instance Burstall

(1975) and MacNamara (1973) conclude that achievement creates motivation. In Finland A-L. Leino (1974) warns of making causal conclusions about the relationship. In addition, she found only a weak relationship between motivation and foreign language learning. A critical standpoint is also taken by Oller and Perkins (1978a, b, c) and even more by Oller later (1981). Both Oller (1981), McDonough (1981) and Ellis (1985) strongly warn against making causal inferences on the basis of questionnaires answered in the middle of the instruction.

In sum, the following could be said about the evidence given by studies concerning motivation and foreign language learning:

- We do not know for sure what motivation is in foreign language learning: the concept is defined differently by different researchers.
- If we accept the main definition given by psychologists (as most researchers do) that a motive shows the strength of a tendency to action, then it follows that the teacher has at least some possibility to strengthen the motivation by pedagogical devices.
- Motivation is, however, a complex cluster of factors, and all of these cannot be manipulated by the teacher. In some factors also parents play a role.
- Motivation has not been shown to be a cause of learning.
- The existing correlational studies between motivation and achievement show a relationship, but not necessarily the direction of this relationship. At present we do not know for sure whether it is so that high motivation always produces good learning or good learning outcome creates motivation to learn more. It is not possible to make causal inferences between motivation and achievement on the base of studies performed in the middle of or at the end of foreign language instruction. This is, however, what has been done in most studies.
- Only longitudinal studies, started at the point when foreign language learning begins, could perhaps give an acceptable answer.

Attitude

According to Gardner and Lambert (1972) motivation is the learner's overall goal or orientation, attitude again is defined as the persistence shown by the learner in striving for a goal.

Attitudes take a long time to develop, and thus it seems natural that parents play an important role in attitude development. The limited research done in the area points in this direction (an extensive research review is given by Gardner 1979). Some researchers (Plowden 1967; Pringle 1980), when giving a survey of parental attitudes, strongly stress how the poor or slow learner is not necessarily 'less able', but the family background may simply be socially disadvantaged.

A child also needs a parent who can offer a model for curiosity and discoveries of the world around (Hawkins 1983, 103). Parents who are interested in foreign languages encourage their children to study them. Yet it is not always so that parents' active pressure on the child gives the expected attitude and learning outcome, but the opportunities they can offer their children do. That the parents' influence is potential is reflected in the linear correlation found between progress in foreign language learning and the status of parental occupation (e.g. Burstall 1975; Hawkins 1983).

The attitude and motivation measures are usually administered simultaneously with the proficiency measures. Yet the positive correlation between language proficiency and affective variables is, according to Oller and Perkins (1978a), generally interpreted in the following way:

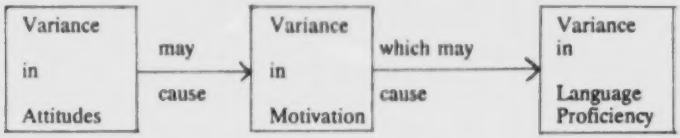

Figure 4. A frequently presented hypothesis about foreign language proficiency and attitude/motivation.

The relationship between attitudes and motivation as shown here is in accordance with Gardner's and Lambert's long-time studies. Also Savignon claims that attitude is the single most important factor in foreign language learning (1976, 295).

This is not, however, the only possible way of interpreting the relationship. The results of foreign language learning might just as well affect attitudes so that successful learners develop more positive attitudes towards the target language. This attitudinal change has been shown by Savignon (1972). Also Burstall (1975) found that achievement affected later attitudes and later achievement to a greater extent than early attitudes affected either later achievement or later attitudes. A similar view is taken in studies by e.g. Chihara & Oller (1978), Oller & Perkins (1978a, b, c), Oller & Hinofotis (1980), and Oller (1979, 1981).

As mentioned earlier, the attitudinal measures are usually taken only once, often several months or even years after the beginning of the studies. Thus the attainment in the target language may cause a positive or a negative attitude. High achievers tend to develop positive attitudes as they go along, and low achievers less favorable attitudes. This was clearly shown in Savignon's study about college students studying French. Students who indicated more positive attitudes at the beginning of a course in French as a foreign language at the University of Illinois did not attain higher levels of achievement in the language, but when the learners were tested at the end of the course those who had attained higher levels of achievement also expressed more positive attitudes at the end of the course. Thus an alternative to the usual assumption about the direction of causation of attitude/motivation is presented by Oller and Perkins (1978a, 95):

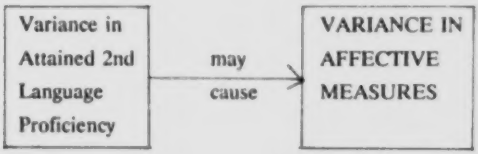

Figure 5. An alternative hypothesis about causation between affective variables and foreign language proficiency

Without sufficient research evidence the assumption presented in Figure 5 cannot be ruled out - in spite of the general opinion of researchers that is presented in Figure 4. Any teacher of English as a foreign language could tell us about positive attitudes of children to the 'new' language at the beginning of the studies. At the beginning of the second year's studies the picture one gets of pupils' eagerness is already completely different. This can also be seen in the class grades given to the pupils, and already during the first year the attitudes to the foreign language tend to be more negative among the poor performers than among the others (Sarmavuori 1983; Hawkins 1983).

Whatever the possible causal direction might be, there still remain other serious problems concerning attitudes. Attitude measures are all necessarily indirect measures. The scales require subjects to be honest, not only towards others but also towards themselves. If e.g. one were to rely on figures given when people are interviewed about their drinking habits, only half the amount of alcohol sold is consumed! (The Economist, July 4, 1987, p. 26.) According to Oller (1981, 25), even the worst of the language proficiency measures appear to be better by any reasonable empirical criteria than the best of the affective measures. Similarly e.g. Buros (1970) considers the affective measures to be among the least valid tests. Oller also points out that in Gardner's studies the correlation between attitudes and motivation indicates that about 60 % of the variance in the two measures is common variance. On the basis of Gardner's data, attitude and motivation may according to Oller be indistinguishable, so that attitude test batteries appear to measure very much the same as the motivation tests.

One more question concerning attitudes must be dealt with. Oller raises the general question of what existing foreign language attitude and motivation batteries really measure. He suggests repeatedly that the items of the questionnaires may assess language proficiency. The same viewpoint is taken by Perkins (see Oller 1979, 1981; Oller & Perkins 1978a, b, c).

The same possibility has often entered the present writer's mind while studying questionnaires - especially those answered by poor performers. There are enormous differences in text understanding among the pupils in an ordinary

primary school class (see e.g. Laurinen 1985). If the questions or alternatives offered are very numerous, the problem becomes even more serious. First, do all the pupils understand the questions or alternatives properly? Second, do they care to read the long text carefully enough if being poor in text understanding? If written answers are asked for, do they care to write properly? Those who are poor in their mother tongue usually have problems both in text understanding and production. Oller (1981) stresses that first language proficiency and intelligence are largely indistinguishable in terms of the variance produced by tests of these constructs. On the basis of different studies he comes to the conclusion that questionnaires themselves are measures of language ability and intelligence. Also self-report questions about attitudes, not believed to have any particular relation to second language learning, were studied and gave the same result. Therefore, one seriously has to consider the possibility that the items in attitude and motivation test batteries to some extent measure language ability and/or intelligence. This possibility is also supported by Tucker (1981). Measurement of attitudes through the use of questionnaires is also thoroughly discussed by Hamilton (1983). To him questionnaires represent problem solving tasks.

Hamilton's view is that free-response self-descriptions are probably superior to the usual attitudinal questionnaires in both reliability and validity. To this can be added that also this kind of measures should be taken both at the beginning and the end of the foreign language studies in order to give reliable information about possible causal effects. It may even be that there is no way of determining whether attitudes are/can be a cause of foreign language learning.

In sum, motivation and attitudes have been given a lot of consideration here because they very commonly have been believed to be among the most important factors influencing foreign language learning. It is the causal aspect that in this study is of most interest. Often the subjects in motivation/attitude research have, however, been grown-up people, even college students, attending a voluntary course in the target language. In this kind of circumstances it is very much possible that attitudes and motivation are excellent predictors of foreign language learning.

1.7. Affective Versus Cognitive in Learning

Affective processes have been the important point of many theoretical analyses of foreign language learning. This is shown e.g. by the attention attitudes and motivation nearly always get. Yet it is the combination of cognition and affect that is at the core of integrated human functioning.

Let us, as an example, think of a pupil who was highly motivated and had positive attitudes towards the target language at the beginning of his studies. Let us then suppose that the performance gradually becomes worse and worse, and after a year or two the student can hardly follow the teaching at all. What has happened and why? If we only look at the affective domain, it will be difficult to find a proper answer to the change. Whatever has happened to the student concerned has also affected his cognitive functioning. The stability of some personality characteristics makes it a lot easier to try to theorize about personality, but sudden changes present a real challenge.

There are some researchers who are very critical to the dominance of affective factors in personality research, among them Upasani (1978); Ahmann et al. (1981); Natarajan & Kulshreshta (1983); Royce & Powell (1983), and Hamilton (1983). Unfortunately, research on 'thought' and 'feeling' have progressed relatively independent of each other. Comparatively little has been written about the relationship between cognition and affect - although it must be considered central to a variety of psychological phenomena. This relationship has been given great importance by Royce and Powell (1983) in their Theory of Personality and Individual Differences.

How also affects can be a result of learning is described by Royce and Powell (1983) with a couple of simple examples. They point out how various aspects of affectivity have clearly been influenced by conditioning and give as examples culturally conditioned fears, such as the fear of snakes or a generalized fear of the dark. Thus although they admit that the affective dimensions are not highly trainable, *learning about situations that result in affectivity does appear to be trainable* (p. 80-81, emphasis by the writers). This could also be exemplified with different kinds of reactions especially towards poor performers' answers.

In cognition-affect interaction the hypothesized role of cognition is in processing the experiental and behavioral aspect of emotion. Affect again is thought to share in the determination of behavioral outputs as well as to be directly involved in the physiological manifestations of emotion. Thus e.g. during an aroused state of anxiety, the relevant cognitive processes will be involved in interpreting the internal and external events. Both cognitive and affective processes interact during such an emotional state. Royce and Powell give the following definition of cognition-affect interaction and emotion: Emotions are differentially patterned states of cognition and affect that involve specifiable deviations from the steady state of the total psychological and physiological system (p. 182-83). Thus different subsets and weights of cognitive and affective factors combine to account for different emotional states of organism. Individual differences in emotion are seen as a product of the interaction between the cognitive and affective systems. Also, according to Royce and Powell (p. 259), cognition and affect form the transformational, or learning-adaptive, level or overall personality with the goal of maintaining cognitive-affective balance in one's adaptations to the environment. Influence of affective factors on intellectual functioning is obvious, and vice versa.

Cognition and affect become increasingly differentiated throughout childhood, and personality becomes increasingly hierarchically organized. Thus also goals undergo change so that cognitive-affective balance provides an appropriate goal for children (and immature adults), but adulthood is more appropriately described as a search for personal meaning. Royce and Powell have developed hierarchical structures of both the cognitive and affective systems. At the top of both systems are higher order factors, which in both cases are three in number. In the cognitive system they are: (1) perceiving, (2) conceptualizing, and (3) symbolizing, in the affective system: (1) emotional stability, (2) emotional independence, and (3) introversion-extraversion. The cognitive factors will be dealt with later. Here the attention is drawn to the fact that when dealing with affective factors in foreign language learning, generally only attitudes, motivation and anxiety have been given special attention. In addition, they have usually been discussed separately from cognition. Yet any description of affective processing must necessarily remain incomplete until interactions between affect and cognition are taken into consideration. In other

words, it is clear that cognitive processes are involved in affect. This may be one reason why attitudes and motivation are not included in the basic affective or cognitive factors in the personality theory of Royce and Powell. Instead, in their theory of the hierarchical structure of affective values (needs), among the first order factors are included for instance achievement and endurance. Achievement entails the accomplishments of difficult tasks while maintaining high standards and the willingness to work towards distant goals, and endurance again is the need to persevere even in the face of difficulty, and to be patient in various work habits (p. 149). Cognitive values Royce and Powell interpret to be psychological interests that direct, coordinate, and evoke cognitive activities in the pursuit of high level goals. Such interests direct cognition towards processing activities that are consistent with the individual's goals. Interests, as well as needs, are dominated by the three value orientations of intrinsic, self, and social (p. 150). Possibly these factors explain more about poor performance than the concepts of attitude and motivation.

The strength of Royce's and Powell's theory from the viewpoint of learning difficulties lies partly in the fact that their theory of personality gives a combined interpretation of affect and cognition, and that it to a great extent deals with individual differences. When we at least try to explain poor learning outcome, individual differences in both affect and cognition are of the utmost importance. Royce and Powell stress that human beings are extremely complex, and therefore a theory about them necessarily becomes complicated, too.

The British psychologist Vernon Hamilton (1983) presents a unified theory of personality in his book The Cognitive Structures and Processes of Human Motivation and Personality. The role of language in cognition is for Hamilton of crucial importance. He also systematically and in great detail tries to explain the role of affect in cognitive processing. Hamilton argues convincingly (p. 125-59) that what has been called the 'affective domain' is in fact cognitive, as are all mental processes according to him. An affective state cannot be known to the individual unless that state is conceptually established and symbolically labeled. Emotions, like cognitive concepts, must be understood as concepts, and must have words attached to the feelings. Thus affect must have representation in cognitive structures. As an example he gives the following question, which has

not been presented very often: How, for example, are we able to say that tomorrow we may be feeling anxious or depressed, because a bill for a large amount is likely to arrive by post? The anticipation here concerns a future event, and cognitively expecting a feeling cannot be due to physiological events which have not yet occurred (p. 137). Hamilton does not deny that feelings or affective preferences have some distinctive somato-sensory characteristics. Yet according to him, an adult emotional response is always a cognitive response whatever its physiological or neurochemical concomitants. Thus to be aware that we 'like' an event, as well as to be able to report it, can only mean that conceptual classifying operations have taken place in an accessible part of the working memory system. This again must mean that emotional, affective feeling tones are in themselves cognitive data. The availability and utilization of such informational data is evidence and a reflection of cognitive operations and processes on cognitively labeled affect structures. Hamilton argues that non-cognitive concepts of personality and motivation are substantially based on early scientific paradigms, and are descriptive rather than explanatory. Interactions between the effects of socialization on personality and motivation, and educational and intellectual development, occur because all response-selecting events are cognitive events.

Hamilton also gives (p. 168-9) detailed descriptions of experiments showing that anxiety is basically cognitive data in permanent memory which encode aversive expectancies of behavior outcomes. He also concludes that anxiety interferes with permanent memory selection processes. This produces an excessively high load on the processing capacity, and accounts for reduction in performance levels and speed of performance.

The emergence of low self-esteem and its gradual development is explained by Hamilton (p. 155) in the following way. A self-concept of competence results from carrying out tasks assigned by others. Task performance occurs against an expected end result and criteria of adequacy. A high discrepancy between criteria of adequacy and evaluation of performance is likely to result in low self-esteem. An experience of 'inferior' has then occurred in frequent numbers of contexts, and has become a principal cognitive structure, or a superordinate schema. This development accounts for the cases where a poor foreign language

learner 'learns' he is a poor learner, and gradually gives up even trying. Hamilton cites several extensive studies, in addition to his own, in support of the view that the factors determining intelligent cognitive performance are the same as those which facilitate personality and motivational differentation.

To summarize, it could be concluded that too often in foreign language learning research either the affective or the cognitive aspect has got very little attention, or they have been dealt with independently of each other. It is hardly possible to prove that poor learning outcome for ordinary primary school children would be a result of either only cognitive or affective factors. It seems most probable that the explanation must be looked for in the interaction of the cognitive and affective domain - if at all there exist two completely different domains.

1.8. Cognitive Complexity and Interpersonal Maturity

The concept of conceptual level can be traced back to the theory of personality development according to which conceptual level (CL) is a person characteristic as an index of cognitive complexity and interpersonal maturity (Harvey, Hunt & Schroder 1961; Hunt & Sullivan 1974).

Cognitive complexity refers to differentiation, discrimination and integration; whereas interpersonal maturity refers to the increasing self-responsibility of a person. Thus a person at a higher conceptual level is more structurally complex, more capable of responsible actions, and more capable of adapting to a changing environment than a person at a lower conceptual level (Hunt & Sullivan, 1974). People differ in their conceptual levels. As could be expected, such individual differences make some people more efficient in the processing, discriminating, and integration processes of the brain, while others are less efficient. The former are those who have higher CL, the latter have lower CL.

In addition, conceptual level provides increasing interpersonal maturity as indicated by self definition and self - others relations. Hunt's B-P-E model is derived from Lewin's idea that BEHAVIOR (B) is a function of PERSON (P)

and ENVIRONMENT (E). Based on Lewin's conception of behavior Hunt proposed the B-P-E-paradigm. He further proposes that the formula B = f(P,E) be used as a paradigm, or coordinating system, for study and application of interactions (Hunt & Sullivan 1974):

General statement: $B = f\left[(P)\right], \left[(E)\right]$

Educational point of view: Achievement of Educational Objective $= f\left[(\text{learner})\right], \left[(\text{educational environment})\right]$

This implies that the achievement of educational objectives is dependent on the effect of the educational environment on the individual learner (Hunt & Sullivan 1974; Hunt 1975). Not only should we identify the three components, we should also understand the interaction that describes the relationship between the variables. Thus, in order to study the interactional aspect, it is essential to specify the three components. From a developmental point of view the index of a pupil's growth can be the following dimensions:

(1) Conceptual complexities
(2) Interpersonal maturity

Under ideal conditions the development is continuous but it can be considered to be the continuation of many segments. Thus, if there is an increase in a person's conceptual level, he is expected to increase in conceptual complexity and interpersonal maturity. The development of CL along the chronological age has been depicted in the following figure:

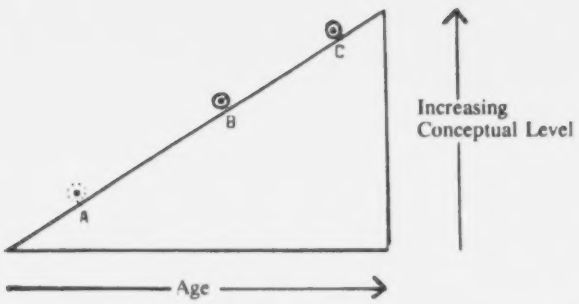

Figure 6. Development of Conceptual Level under ideal conditions (Hunt and Sullivan 1974, 209).

Progress in conceptual development is marked by increasing interpersonal maturity and increasing self-responsibility, increasing conceptual complexity and effectiveness in processing information. As shown in Figure 6, a person at stage A is hardly developed in conceptual complexity. It means that he is poor in discriminating, integrating and processing information. A person at stage C is more independent and superior in processing information and differentation as well as integration than stage A and stage B persons.

It is an important observation that people with high CL are more effective in information processing than those who have low CL (Hunt & Sullivan 1974; Hunt 1975). A person with high CL is also capable of adapting to a changing environment, is more stress-tolerant and considerate. A high CL person (stage C) can form at least two concepts about the same elements of information (Schroder et al. 1967). A child who has higher CL than others of his own age will be able to perform tasks where complexity in information processing is involved, whereas a child with low CL will not be able to perform such tasks efficiently.

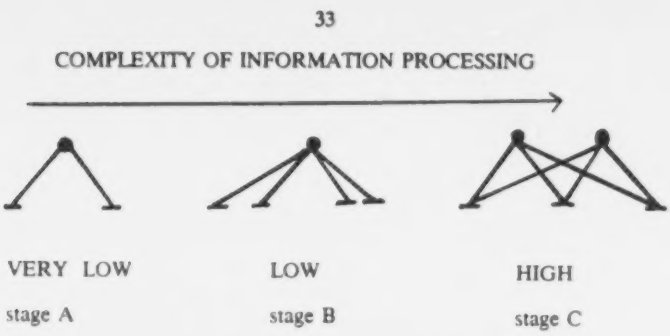

Figure 7. Contemporaneous characteristics of variation in Conceptual Level (modified from Hunt and Sullivan 1984, 212).

A person having higher CL should be able to discriminate, integrate, and differentiate the information more effectively than a person low in CL. High CL may for these reasons be assumed to be positively related to effective and efficient processing of foreign language learning. Thus individuals showing low CL are likely to perform poorly on foreign language learning tasks, because certain mediatory conceptual processes might be missing or be weak in their processing systems.

The theory has been proved very useful for general educational research and is widely appreciated. It emphasizes the student's mental growth, and also shows how important it would be for the teacher to adjust his teaching according to the understanding of each pupil. In addition, the importance of the person-environment interaction is emphasized. The Paragraph Completion Method-test (the PCM-test, Hunt et al. 1978) has been administered to several thousand persons. It has repeatedly been shown by the Canadian research team that pupils who have low CL profit more from a high structure teaching, and pupils scoring high in the test profit more from a low structure teaching or are less affected by variation in structure. The results give a lot of badly needed information about poor performers. The test was originally primarily developed for school children in grades 6-13 (Hunt et al. 1978, 39). It has, however, also proved useful among adults, e.g. teacher trainees (Hunt & Sullivan 1974; Hunt

1979; Leino & Puurula, 1983). For further discussion about learning difficulties (in e.g. mathematics and foreign languages) related to cognitive processes see e.g. A-L. Leino & J. Leino (1982).

One remark of importance must, however, be made. Hunt et al. admit that Conceptual Level (CL) measured with the PCM-test is related to IQ/ability/achievement, but they go on saying that it is distinct from those. Persons very low in ability/achievement are almost always low in CL. High ability/achievement persons, however, vary enormously in CL. This may be connected with the interpersonal immaturity side measured by the test. People showing immaturity in personal relationships at school level tend to solve problems with e.g. aggressiveness, i.e., with other means than words. Yet the test cannot be said to measure only verbal intelligence, either. A high processing level of thoughts, needed for high CL, also greatly requires reasoning abilities. One cannot discriminate, integrate, and differentiate information effectively without high-level reasoning. Hunt's idea of Conceptual Level is especially interesting from the point of view that it combines effectivity of information processing and emotional maturity. Thus, lack of interpersonal maturity and poor self - others relationship might spoil the learning outcome not only in foreign language learning but in learning in general.

In Finland A-L. Leino (1980, 1982) tested comprehensive school pupils (N = 107) with the PCM test of Conceptual Level. It was found that the majority of those who were high in CL was also doing well in their foreign language studies, and the majority of the low CL group was less successful in their studies. Later, pupils scoring high and low on the test were chosen for a structured interview about language ability and responsibility in their working habits (N = 18). The results followed the CL theory: in interview situations the high CL-cases considered different aspects of the questions, saw several alternatives, did not often give an either-or answer, and verbalized and specified their responses more than did the low CL-cases. The study gave additional confirmation of the Paragraph Completion Method test as being an effective instrument to get information about students' intellectual and emotional development.

1.9. The Concept of Intelligence

Learning a foreign language involves intellectual abilities referred to as inteliigence. Intelligence is the abstract and hypothetical measurement construct which has been used to measure the general level of cognitive functioning. Yet, intelligence must be said to be among the most elusive concepts. In recent years there has been a move away from intelligence testing as the major means of assessing cognitive development, while at the same time new forms of measuring intelligence have been and are being developed.

What then is intelligence? The term is used in so many different ways by different researchers that at this point we will only give Sternberg's & Salter's (1982) and Hamilton's (1983) general definition which they share with many other recent researchers: Intelligence is expressed in terms of adaptive, goal-directed behavior.

There are, however, several problems connected with traditional intelligence tests. They have usually not been derived from a particular theory of intellectual development, but have rather sampled aspects of cognitive behavior which have been found to differentiate between the average performance of groups of people of different ages. Intelligence has in fact become 'what intelligence tests measure'. The selection of items for intelligence tests does not reflect a theoretically based view, but rather the fact that these items differentiate between groups of children and are predictive of later school success. The tests sample a few hypothesized factors, but not all possible factors, nor is the selection always made in a very systematic way.

Intelligence tests should certainly measure or at least predict behaviors that are relevant to the sociocultural context in which an individual lives. The recent development has also gone in the direction of more criterion-referenced testing. The present view suggests that intelligence is not quite the same thing for different people and for different situations (see e.g. Eysenck 1979; Sternberg 1982, 1985 a, b; Lunt 1983; Wagner & Sternberg 1986). It is admitted by several researchers that the most critical need in ability testing today is to develop measures that are more sensitive to kinds of intelligence that are important in

real everyday life. These tests would supplement the academic kinds of intelligence measured by traditional tests. Several researchers have during recent years stressed the fact that only when the environmental challenge, opportunities, and motivation are similar will individual differences in cognitive abilities reflect differences in underlying intelligence. Ceci and Liker (1986, 119-42), when analyzing academic and non-academic intelligence, point out that they go so far as to believe that IQ and intelligence are not necessarily related at all. Yet they do believe there is some human capability that properly can be called 'intelligence'. This intelligence then limits how much can be acquired in a particular cognitive domain, while the environmental challenges and opportunities that one faces determine what shall be acquired.

Intelligence tests sample behavior only in certain domains. In recent years also several other researchers have started to look at the validity of the traditional intelligence tests (e.g. Eysenck 1979, 1982; Oller & Perkins 1978a, b, c; Oller 1978, 1979, 1981; Flahive 1980; Stump 1978; Gunnarsson 1978; Entwistle 1981; Sternberg 1982, 1985a, b; Lunt 1983; Sutton 1983; Carroll 1982; Olson 1984, 1986; Wagner & Sternberg 1986). Researchers repeatedly point out that nobody has sought to validate certain crucial assumptions. Ceci & Liker (1986, 133) ask whether such basic cognitive processes as memory, perception, inferencing, and problem solving are acontextual. They stress the fact that even such cognitive processes as memory strategies have actually been shown to be under the influence of contextual variables. Effective cognitive strategies have been shown to depend on the nature of the task (e.g. its interest level to the subject) and the setting in which the task is presented (one's own home versus unfamiliar home versus a university laboratory). A frequent observation from such research has been that children who appear deficient in the use of microlevel cognitive strategies in one setting or on one task will deploy them spontaneously in a different setting or on a different task (Ceci & Bronfenbrenner, 1985). Later Ceci & Liker (1986) suggest that it is very much probable that also macrolevel cognitive activities, like thinking and reasoning, are similarly under the influence of contextual variables. Thus, even if performance on academic tasks might be taken at its face value, it ought not to be stretched beyond that. As an example they mention that poor performance on a digit span test may be uncorrelated with auditory short-term memory for digits

in another context, such as gambling (p. 134). From the school world we could suggest that a result on a digit span test might very well be uncorrelated with remembering sports results, and remembering foreign language words certainly need not necessarily always be correlated with remembering the names of foreign sports champions. Also Lunt (1983) and Olson (1984, 1986) strongly stress that intelligence tests could be samples of certain competence, not necessarily measures of any underlying abilities. Olson does not criticize intelligence tests as such, only the way test results have often been interpreted. He does not believe that the cognitive operations measured by intelligence tests are universal. Yet according to him it is useful to measure these cognitive operations. Traditional intelligence tests, however, do not seem to be enough in order to find out a person's cognitive capacities. (For a detailed discussion of validation of intelligence tests and theories, see e.g. Sternberg 1985a.)

1.10. Verbal Intelligence and Foreign Language Learning

The traditional intelligence tests often consist of what is called a verbal part and a nonverbal part. Thus, in addition to general intelligence, it is possible to look at a profile of subtest scores in order to get a picture of a person's comparative scores on different subtests. By doing so we may find areas of strength and weakness in addition to general developmental level. If the purpose of intellectual assessment in a foreign language learning context is diagnosis with a view to remediation, statistical scores showing peer-related comparisons are not enough. More detailed knowledge of the child's verbal abilities are needed for this purpose.

When looking at the verbal components of intelligence tests some questions arise. Have the results in the verbal part of an intelligence test anything to do with language learning? Do not all children attending ordinary primary schools possess normal verbal intelligence? After all, children starting school are considered mature enough to start school, and they speak their mother tongue fluently. It is probably for these reasons that the role of verbal intelligence in foreign language learning has seldom been looked into deeply enough. Many researchers refer to a positive correlation between the two, but leave the

question at that. Some researchers even mention - without giving any evidence - that intelligence does not appear to be an important factor in first language acquisition, and its relevance to foreign language learning is thus questionable (e.g. McDonough 1981; Ellis 1985). McDonough's statement is, however, contradictory to his own statement that measured intelligence is difficult to separate from first language knowledge at school age, because most intelligence tests are conducted through the medium of language (p. 127). It is understandable that researchers used to take for granted without any empirical experiments that foreign language learning is unrelated to intelligence - because everybody has already learnt one language. McDonough (p. 127) and Ellis (p. 111) refer to Lenneberg in these circumstances. Lenneberg (1967) did show that all children except very severely mentally retarded, succeed in developing grammatical competence in the mother tongue. As Oller (1980, 101) points out, however, any further statements about the non-relationship of the ability in one's mother and foreign language learning are based on mere presupposition and conjecture.

Research on how ability in the mother tongue may interact with cognitive development is, of course, nothing new. As early as 1926, Piaget stressed the importance of verbal social interaction for the child's cognitive development. Vygotsky (1962, p. 34; 1978) relates culture and language closely to cognition, and even claims a causal influence of the language use (especially of talk and thought) in cognitive development. In research of intelligence testing e.g. Jensen (1969, 1980) and Carroll (1985) strongly stress the importance of language.

The question 'What do tests of intelligence measure?' is being asked by more and more researchers. Even more results show how intelligence tests, both the verbal and nonverbal parts, seem to measure language ability or vice versa. This view has strong advocates, including Olson. In 1983 Olson and Torrance relate literacy and cognitive development closely together, and they also stress the importance of metalanguage.

Also earlier, in 1977, Olson claimed that it is clear that what we call intelligence in our culture is little more than a mastery of the forms of literate uses of language. He gives an example of how a high IQ reflects a high literature orientation. If a child to an intelligence test item like: 'How are an

apple and a peach alike?' answers: 'They are both to eat', he gets only one point, but double points for the answer: 'They are both fruits'. Yet the child is able to pick up an apple from a basket among other items there. But it may also concern unability to understand the language. If a foreign language teacher gives the question: 'What are oranges and apples?' to 9-year old pupils, there are some who cannot answer simply because they are not familiar with the concept 'fruit' even in their own language. This naturally reflects the fact that all children have not reached the same linguistic level at the same age, but it need not mean that the children differ in all mental abilities. Olson summarizes that what we naively take to be a reflection of an underlying quality of mind, intelligence, is in fact the mastery of a particular, and biased, set of symbols for representing experience, primarily written language. Nearly ten years later Olson (1986) made an even stronger attack on intelligence as a general quality of mind. According to him, intelligence tests are still valid measures of level or degree of competence with a particular cultural form, namely written language. Yet the whole concept of intelligence rests, according to him, on a fundamental error, and it does not explain why some people are better than others at some tasks. Types and levels of intelligence are thus only descriptive notions.

Several other researchers have by now found that performance on language understanding and usage tests correlates with intelligence test scores. The evidence strongly suggests that intelligence and language ability to a certain extent may in fact be the same thing (e.g. Oller & Perkins 1978a, b, c; Genesee 1976; Jensen 1969, 1980; Kennedy 1973; Oller 1978, 1979; Gunnarsson 1978; Stump 1978; Streiff 1978; Flahive 1980; Oller & Hinofotis 1980).

On the basis of empirical research arrived at by several researchers Oller concludes that language proficiency of verbal intelligence probably accounts for as much as 64 % of the variance in the so-called g-factor of intelligence as measured by a variety of tests. This relationship is seen in Figure 8.

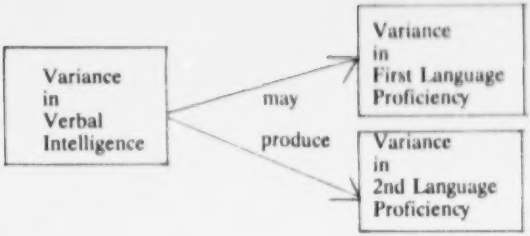

Figure 8. A possible relationship between verbal intelligence and first and second language proficiency (Oller and Perkins 1978a, 92)

It is difficult to find evidence to contradict the claims that some of the variance in verbal intelligence is common to variance in first and second language proficiency. The relationship has not only been studied by statistical methods, but also by careful analysis of test items in several widely used standardized intelligence and achievement tests as well as personality inventories. Gunnarsson (1978) found that there are fundamental content similarities between achievement batteries, intelligence tests, personality inventories, and language proficiency tests. He could even show that it was hard also for experts to distinguish between items taken from achievement, intelligence, personality, and language tests. Gunnarsson's test can be checked by anybody, as his Test of Standardized Tests is printed in Oller and Perkins (1978b, p. 19-21). Stump (1978) in his experiment 'Cloze and Dictation Tasks as Predictors of Intelligence and Achievement Scores' studied mainstream school children (109 fourth grade and 95 seventh graders in St. Louis schools). The test batteries he used were the Iowa Test of Basic Skills (ITBS), and the Lorge-Thorndike Intelligence Test, along with several dictations and cloze tasks. Both the cloze tests and the dictations dealt with topics supposed to be of interest to children (a new bike, a cat named Traveler, a strange dream, a Saturday night party, etc.). Stump found that a single general factor (whether one calls it language proficiency or verbal intelligence) was sufficient to explain 54 % of the variance in all the tests for the fourth graders, and nearly 70 % for the seventh graders. Stump concludes that all the tests measure essentially the same thing, i.e., global language

proficiency. It is of importance to notice that both the cloze and dictation tasks produced a very substantial degree of variance within both groups. What Spearman called general intelligence, the g-factor, explained the language proficiency of both poor and good performers. In case the same applies to foreign language learning, we face a difficult problem. *How can we explain the general opinion that intelligence cannot be changed a lot but language proficiency can?*

There are several similar research results, also research done among bilinguals. Streiff (1978) conducted a study among Hopi-English bilingual children in northern Arizona. The subjects were school children from grades one to six, and their command of English varied quite considerably. Thus most of the pupils were not real bilinguals. It was found that 70 % of the variance in all the tests used was attributable to a single general factor that could hardly be called anything else than English language ability. The tests and tasks used were similar to those of Stump including also an oral cloze test. Streiff concludes that language is a major variable in the achievement test scores (California Achievement Test) for the population of Hopi children tested.

The studies referred to have concerned a rather limited number of students. Later much bigger populations have been tested with similar test batteries, and the results only confirm what was found earlier. Oller (1980) reports a study in North Carolina where 46 000 high school students from grade eleven were tested with a very large test battery (the California Achievement Tests, the American College Tests, a locally prepared reading and arithmetic test, etc.). The intercorrelations among the subtests of the various batteries were at or above .80, most about .90. Oller concludes that a single general factor would account for essentially all the reliable variance (p. 100).

On the basis of the research referred to, at least the following questions arise: Can a component of verbal intelligence be distinguished from a component of reading ability? How is reading ability related to foreign language learning? Can they be completely separated from each other? Can foreign language learning be improved if nothing is done to improve native language ability? What about nonverbal intelligence and reading ability? One could also assume that if what is called nonverbal intelligence is closely related to mother tongue learning, then it would affect foreign language learning as well. This question will be looked into on the following pages.

1.11. Nonverbal Intelligence and Foreign Language Learning

On the basis of research done in the area, the relationship between language ability and verbal intelligence seems clear. Many of the tests used for measuring the relationship, however, also contain a nonverbal part. Sometimes the relationship has been studied separately, sometimes the verbal and nonverbal intelligence has just been referred to as general intelligence. Whichever the case, nonverbal intelligence has also been claimed to be connected with foreign language learning and language learning in general (Oller & Perkins 1978a, b, c; Oller 1980; Genesee 1976; Stump 1978; Flahive 1980; Genesee & Hamayan 1980; Olson 1984; d'Anglejan & Renaud 1985).

How can we explain that nonverbal intelligence tests measure language ability, mother tongue or foreign language, or both? Some researchers (Oller 1980; Olson 1984) give as an explanation the fact that certain test instructions are long verbal explanations and consist of complicated language. Therefore the tests concerned mainly measure language ability. This evidence does not, however, prove the relationship. There are also nonverbal intelligence tests where no language is needed at all in the instruction, nor in the test itself. For instance, when claiming language understanding in nonverbal tests some researchers refer to long verbal instructions used for the very young children's version of Raven's Progressive Matrices, a test of nonverbal intelligence. Anybody can, however, easily check that ordinary school children of 10 - 12 already understand what is to be done without even one word of verbal

instruction. Thus the test cannot possibly measure only verbal understanding. Yet this does not rule out the possibility that the test measures something common to verbal and nonverbal intelligence.

What could be the common factor that both verbal and nonverbal intelligence tests measure? As pointed out, it cannot only be language ability. We know that in order to master one's own language one must be able to learn, remember, and use rules. Reasoning is required to understand rules. Reasoning is also needed for general text understanding. Every teacher who has had an opportunity to teach grammar in the mother tongue or a foreign language, as well as mathematics, knows that those who are poor in learning grammar seldom are good at mathematics, and vice versa. The question arises: What is needed for both? What must one be able to do in order to learn and use grammar rules as well as solve mathematical problems? Without knowing anything at all about intelligence, one could answer: As a minimum, one must be able to reason and make inferences. One must be able to analyze tasks. These are exactly the abilities needed for most nonverbal intelligence tests. In addition, reasoning is also needed in most verbal intelligence test items, excluding general knowledge and information items. Reasoning ability might thus be needed also when learning a foreign language.

If there is a close relationship between language ability and reasoning ability, this might turn out to be of value when considering remedial instruction. It does not help us a lot to know that some pupils are poor foreign language learners, we should also know what mental processes have not developed equally well among poor and good learners. One could try to find out why reasoning ability has not developed well enough, and then perhaps develop ways to improve it. And even if it would turn out to be impossible to answer the question: Why ...? it would be helpful to determine precisely what a child cannot do. This finding would be of even greater value if a child has normal verbal intelligence. At present we do not seem to be able to answer many questions concerned with 'whys', and therefore we must at least try to find out how and in what ways poor and good foreign language learners differ from each other.

Vocabulary learning has often been considered, and also found, to be an excellent measure of what is called general intelligence (Eysenck 1979; Jensen 1980; Sternberg & Powell 1983). It has also been shown that the acquisition of word meanings is highly dependent on the deduction of meaning from the contexts in which the words are encountered, and that vocabulary is an excellent predictor of discourse understanding (Jensen 1980; Anderson & Freebody 1981). In extracting the meaning of a word with the help of the context reasoning is needed. Takala (1984a) found in an extensive study about Finnish school children's vocabulary in English that the vocabulary size of the fastest learners was manifold compared with that of the slowest learners. This finding, also, lends support to the importance of reasoning ability in language learning.

Of special interest in this context are the findings of Marshalek (1981). He found that subjects with low reasoning ability had great difficulties inferring the meanings of words. In addition, reasoning was related to vocabulary measures at the lower end of the vocabulary difficulty distribution but not at the higher end. A certain level of reasoning ability may thus be necessary to understand words, especially for extracting word meanings. Above this level the importance of reasoning ability decreases. In both mother tongue and foreign language learning this could mean that it would be possible for the poorest learners to acquire a fairly concrete vocabulary consisting of high frequency words in everyday speech, but probably not a very abstract vocabulary. This would also mean that oral foreign language ability, ability to discuss ordinary everyday matters, would be accessible also to poor learners, but probably not the ability to understand or produce language containing highly complicated grammar and infrequent words.

The relationship between verbal reasoning and foreign language learning was empirically studied as early as 1972 and 1974 by A-L. Leino in Finland. She investigated the personality and intelligence variables related to English school achievement among senior secondary school students (N=64) and found (1972) that correlations between the English school achievement variables and the personality variables (Cattell's 16 PF/A) were generally low. Only Relaxed Security and Dissatisfied Emotionality were found to be related to English school achievement. Of the intelligence variables, five in all, the best predictor

was Verbal Reasoning, followed by Linguistic Interest and Word Memory. Later (1974), when also motivation, for instance, was included in the study, the results were confirmed, and the reasoning-type of verbal intelligence turned out to be the best predictor, whose proportion of the explained variance was 34 %. In all the analyses where intelligence variables were included reasoning emerged.

The role of both verbal and nonverbal reasoning in foreign language learning has been studied by Genesee (1976). He studied pupils at the same grade level as Leino did, as well as younger children (grade levels 4, 7, and 11). The students were studying French as a second language. Genesee's main interest was to investigate the suitability of French immersion programs for children of relatively low intellectual ability. Also classes from ordinary FSL were included in the study. The intelligence test used was Canadian Lorge-Thorndike Test of Intelligence (1967), which included both verbal and nonverbal reasoning. The students were classified as high, medium and below average in IQ. The results of all the three test batteries used (reading, FSL, and mathematics) varied according to IQ level. At all grade levels and on all these tests the above-average students scored higher than the average students who again scored higher than the below-average students. These findings for the good, average, and poor performers are not very surprising as such. The results are, however, of special interest for two reasons. First, the close relationship between ability in mother tongue and second language was confirmed. Second, when the different parts of the language test and the results of the different ability groups were compared, it was found that performance on the tests of listening comprehension and interpersonal communication skills did not correlate with IQ level. This was true for students at all grade levels both in FSL classes and in immersion programs. Genesee interprets the results by referring to first language learning: Practically all children acquire fluent interpersonal communication skills in their native language, and thus children are also more motivated to learn those skills in the second language. It could also be added that those were the abilities they probably needed most. Genesee concludes that the results indicate that groups of children with different levels of intellectual or academic ability are equally able to learn second language skills which are related to interpersonal communication. This generalization may be correct considering that the research was done in Montreal. Such a generalization, however, could

hardly be made in a country like Finland, or in any other surroundings where the second language concerned is not heard very often, or the two languages are not at all related. In several countries some pupils have been found who have considerable learning difficulties also in simple communicative skills. Genesee's finding has, however, great methodological value: poor performers will most probably be better learners if communication abilities are taught, and required, preferably in a way that simulates native language communication situations, and preferably about topics that interest pupils and where they can express personal opinions.

Similar results concerning the relationship between intelligence, different teaching methods and foreign language learning have also been found by other investigators. Chastain (1969) reports a significant correlation between intelligence and foreign language learning when students were taught according to cognitive-code methods but not when taught by audiolingual methods. Ekstrand (1977) found only low-level correlations between intelligence and proficiency when these were measured on tests of listening comprehension and free oral production, but much higher correlations when measured on tests of reading comprehension, dictation, and writing.

Cummins (1979) goes so far as to claim there are two different kinds of foreign language ability: 1) cognitive/academic language ability (CALP), and 2) basic interpersonal communication skills (BICS). According to Cummins these two are independent of each other. There can, however, hardly be two completely different kinds of foreign language - or any language - abilities. It would probably be better to speak of different levels of abilities. The reason why Cummins considers there exist two different kinds of languages which also are independent of each other might be that some people differ in their foreign language use. Some people are more outspoken and less critical when speaking a foreign language, have less inhibition when speaking, do not care about mistakes or errors. Others do not want to say anything unless they are perfectly sure about the correctness of what they are going to say. For the former group the only important thing is that the message is understood. Thus more research is needed to prove the existence of two different kinds of languages. Yet the results strongly indicate that also so-called poor learners would have a chance of

succeeding if teaching were concentrated more on communication skills, demanding no correct grammar. To sum up we could say that research in the area indicates that verbal and nonverbal intelligence probably play a bigger role in traditional grammar-centered foreign language learning but is not so important when communicative skills are aimed at, or when a second language is acquired in natural surroundings.

That reasoning is an important factor in formal foreign language learning has gained additional support from experiments by Genesee & Hamayan (1980), Flahive (1980) and d'Anglejan & Renaud (1985). They all employed Raven's Progressive Matrices - Standard form (SPM) to measure nonverbal intelligence, in addition to ordinary foreign language test batteries. The relationship was studied, and high correlations were found by the researchers. As reasons for using the Raven's Progressive Matrices Test its validity and reliability in a wide variety of non-English-speaking settings and the fact that it is completely language-free are mentioned by the researhers. As a measure of nonverbal intelligence it has become popular all over the world. The test is also often referred to as a test of abstract intelligence, because it requires reasoning without any verbal material included. According to Raven et al. (1983) it is a test of a person's capacity to understand relations, form comparisons, reason by analogy, and by doing so, develop a systematic method of reasoning. Raven also describes the scale as a test of observation and clear thinking and stresses that it is *not* a test of 'general intelligence', and that it is always a mistake to describe it as such, as has been done by several researchers. The test requires primarily inductive and analogical reasoning, but also memory must be involved as well as language to a certain degree indirectly, when the subject is solving problems silently by himself. (For a detailed analysis of different kinds of reasoning needed in problem solving see J. Leino 1981; Sternberg 1982, 1985a; Pellegrino 1985; Johnson-Laird 1985.)

Although the Progressive Matrices Test is correlated with tests of general intelligence, it is very different from verbal intelligence tests which always contain subtests where recall of earlier verbally learnt material is needed. Reasoning tests all require problem solving and the application of old learning to new situations, whereas the recall tasks basically require the retrieval of

stored information. Kaufman (1979, 142) stresses that these processes are quite different and relate to the distinction between the higher abilities of abstraction and rational thinking versus the lower associative skills. The distinction between the two kinds of processes, reasoning and recall, is also stressed by neuro-psychological researchers. According to Hebb (1949) the mental activity accompanying problem solving occurs primarily within the association cortex and differs qualitatively from the processes involved in the recall of stored information. There are people who have exceptional stores of knowledge, but who are not good at insightful thinking. On the other hand there are people with relatively poor memories who can solve difficult or subtle problems.

The rationale behind Raven's test of reasoning ability explains why some researchers during the last decade have started to understand its value when confronted with the disability to learn foreign languages. Flahive (1980) examined the relationship between scores on the Raven's Progressive Matrices Test, three reading tests and the Test of English as a Foreign Language (TOEFL). The subjects were 20 students representing seven different native languages enrolled in a semi-intensive English class. The scores on Raven's test and on the TOEFL were used to predict reading comprehension scores on three reading tasks. The nonverbal reasoning ability scores accounted for nearly the same amount of variance as the TOEFL scores when the paragraph comprehension portion of the McGraw-Hill Basic Skills System Reading Test was used as the criterion variable. Considerably less variance was accounted for on the Predicting Paraphrase Recognition Test, a considerably easier test. The McGraw-Hill Test is designed to measure a subject's ability to make inferences, to pick out main thoughts and supporting ideas, and to discover organizational patterns in paragraphs and essays. Flahive concludes that it is fairly clear that traditional tests of reading comprehension do not test only foreign language proficiency but also intelligence, i.e., in fairly difficult reading comprehension analytic reasoning is required.

The available research on foreign language learning has mainly been carried out with adolescents or adults. When young children have been involved, usually only one single class of pupils has been investigated. In addition, it has often been suggested that for young learners intelligence may be less strongly

correlated with second language acquisition (see Krashen 1974; Genesee 1979). In order to throw light on this question Genesee and Hamayan (1980) investigated individual differences in French language achievement in two classes of grade 1 native English-speaking children (29 girls, 23 boys). The children were attending an early French immersion program. French was not used by any of the children at home, nor did they have a regular opportunity to use French in the neighborhood. There were several predictor factors, among them nonverbal reasoning ability, degree of field-independence, and school-related behavior. Also personality traits and affective factors were included. Achievement in English reading was also assessed. Multiple regression techniques were used to analyze the associations between the predictor factors and the results of the achievement tests. In order to systematically reduce the number of predictors, the scores were first factor analyzed, and the five most prominent factors were chosen for further analysis. They accounted for 62 % of the total variance in the predictor scores. Field independence and high nonverbal reasoning loaded on the same factor and together accounted for nearly 20 % of the variance. The results of the regression analyses showed that the overall regression effect for the French test was significant, and that two of the predictors were significant, the best predictor being field independence/nonverbal reasoning/schooling in French, the second teachers' ratings. The affective indices, as well as the personality characteristics were not significant, some even in a direction contrary to the expectations. The best predictor of performance on the English language test was the students' performance on the French language test. This result is in accordance with earlier findings about the close relationship between mother tongue and foreign language learning. And again, the students' French oral production was largely unrelated to their English reading skills.

Also d'Anglejan and Renaud (1985) used Raven's Progressive Matrices test when studying learner characteristics and second language (French) learning among adult immigrants (N=391) in Montreal. They criticize the fact that learner characteristics are often studied as if they existed in isolation. They used nine predictor variables: nonverbal reasoning (SPM), years of schooling, age, use of French, cognitive style field dependence/-independence (GEFT), classroom anxiety, competence in English, contact with Francophones and

literacy/illiteracy. The students were enrolled in a 900-hour intensive French course (7 months, 6 hours a day) offered by the government in Montreal. All received a scholarship to be able to attend classes full time. This should heighten the motivation. A comprehensive standardized test for immigrants and the teachers' evaluation of the subjects as 'good learners' and 'poor learners' were used as criterion variables. According to official reports some learners made reasonable progress, but *some 15 to 20 % appeared to learn very little*. A multivariate ANOVA was used to assess the relative contribution of the learner variables on the FSL test. The results showed that Raven's Progressive Matrices was the best predictor variable when the interaction effect had been partialed out by the regression equation. Nonverbal reasoning predicted by far the greatest proportion of the variance, approximately 18 %. The three other significant predictors were years of schooling (4 %), age (inversely related, 3 %), and use of French (2 %). Higher levels of illiteracy and classroom anxiety as well as greater age were related to learning difficulties. Only approximately 30 % of the variance in the FSL test scores was explained. The percentage is surprisingly low, considering the number of learner variables involved. In A-L. Leino's experiment, discussed earlier in this section, more than 50 % of the variance was explained, and about 30 % by verbal reasoning alone.

On the basis of research done by employing the Raven Progressive Matrices test a very clear picture emerges: There seems to be a relationship between nonverbal reasoning and foreign language learning. This assumption gets additional support from studies in Finnish elementary schools (Patjas 1976; Koivumäki 1979, 1980). Eeva Patjas-Koivumäki found that the best predictor of grades given by the teachers not only in foreign languages but also in some other subjects was nonverbal intelligence/reasoning measured by Raven's test. She studied pupils in grade 4, age group 10 - 11 (554 girls, 567 boys). To sum up, the results suggest that pupils differ in their foreign language as well as their reasoning abilities at a very early stage indeed. Yet, oral proficiency seems to be a realistic aim for all students.

1.12. Mother Tongue Abilities and Foreign Language Learning

There seems to be at least one clear reason why the relationship of mother tongue learning and foreign language learning is fairly seldom thoroughly dealt with in British and American research: all school children there do not have to study a foreign language for several years as a compulsory subject - and certainly not two like in Finland. The same point of view is expressed as early as 1970 by A-L. Leino. In fact, as far as it has been possible for the present writer to find out, there seem to be very few countries in the world where two other languages in addition to the mother tongue are studied as compulsory subjects at elementary school level. One could expect that problems arise especially if the main second language to be studied is not related to the mother tongue. Then it becomes of interest to know if the students differ in the same way in their foreign language and mother tongue abilities. Practically all research about foreign language learning is, however, done without any simultaneous attempt to find out the person's command of his mother tongue. Takala (1977) reports an experiment where successful oral second language learning was mainly explained by good command of mother tongue abilities: grammar, ortography and reading. The research was done by G. Bastin in Belgium during the years 1973-1975. About 240 pupils of the age group 11-13 participated in the experiment. In Finland Sarmavuori (1983) compared the skills in the mother tongue and the foreign language among 90 elementary school pupils (43 girls, 47 boys). The pupils were in grade 3, age group 9 to 10, and had studied the foreign language - English or Swedish - for one year. Neither of these languages is related to the pupils' mother tongue Finnish. The skills acquired in the mother tongue accounted for 62 % (the boys) and 69 % (the girls) of the grades given in the foreign language. The highest correlation was between the grade given in mother tongue reading ability and the foreign language grade (.77 for the girls and .66 for the boys). According to the teachers' judgement there were nine pupils (10,34 %), seven boys and two girls, who did not reach the basic goals in any of the foreign language skills: speech understanding and production, pronunciation, mastery of structures, text understanding and vocabulary. They were also poorer than their classmates in reading and writing their mother tongue, and had been so from the very beginning. Their average verbal IQ, measured when they started school (age 7), was 101 while the average of the

rest of the pupils was 110. Although in this research the pupils' skills in the foreign language were only measured by the grades and the judgements given by the teacher, the results point in the direction of a close relationship between mother tongue and foreign language learning.

Hierarchical levels of mother tongue abilities have been studied by Laurinen (1985). She studied the relationship between text understanding and the ability to produce different kinds of elaborations. The understanding of verbal information depends on the activation of the earlier knowledge in memory. As people understand language differently, they also construct different kinds of representations of the same information. In her experiment Laurinen used three different kinds of elaborations: in a context inferencing task the subjects put sentences in different contexts, in a causal inferencing task they inferred alternative causes for events, and in a free elaboration task they were asked to produce as many elaborations as they could on sentences. The subjects were 84 second, 54 sixth graders and 54 university students in Finland. A stepwise multiple regression analysis on text understanding was applied only to the data gathered from the second graders. The total variance explained was 53.6 %. The number of alternative causes for the same events was the most powerful predictor in the model (see Figure 9). This variable alone accounted for 24.8 % of the total variance explained of the text understanding scores. The second predictor was the number of contextual elaborations produced in the free elaboration task, and the third significant predictor was the latency of elaborations first given to the sentences in the free elaboration task (the second graders were tested individually). Together these three variables accounted for 45.24 % of the variance in text understanding. It is to be noted that although the text was taken from a children's history book, *18 second graders scored zero in text understanding.* The main results of the whole study are summarized in Figure 9. Although the amount of explained variance is never absolute in any regression model but is dependent on the combination of the selected variables, yet the evidence of variability in the command of one's native language should be looked into when studying additional language learning. During recent years signs have appeared that language development is not something that is more or less finished in early childhood, but that it goes on until late adolescence at least. Parents differ in the amount of verbal training they give their children not only during the first

years after the child's birth but also later. It is necessary to consider a possible causal link between child rearing activities and the development of verbal and nonverbal abilities in general.

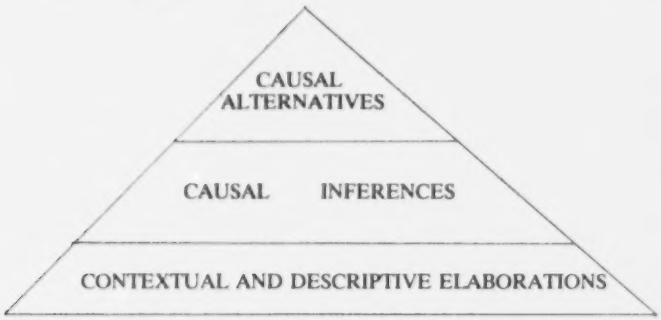

Figure 9. The hierarchical levels of language understanding (Laurinen 1985, 152).

In the light of the literature presented and discussed above, it seems that a wide range of factors, e.g. foreign language aptitude, motivation, attitude, verbal and nonverbal intelligence have been reported to be related to foreign language learning. There exists, however, no consensus on the most important factor that might explain the process of foreign language learning. It is logical to assume that both cognitive and affective processes interact in order to mediate the process of foreign language learning. Whether the specific processes of learning a foreign language are identified or not it is important to explore the processes further. A person's performance on Raven's Progressive Matrices test reflects his ability to perceive, rationally manipulate, and discriminate images at an abstract level. If these abilities are needed in order to comprehend, manipulate, and produce the target language, it must be reflected in the person's performance on the test concerned. At the same time, however, language does not emerge from a vacuum. Language is interpersonal behavior, and communication implies the perception and comprehension as well as production of both the speaker and the listener. Then, not only differences in capacity are involved but also the interpersonal relationship. As to what extent an individual has matured in dealing with other people will perhaps also affect his performance in his mother tongue as well as in foreign language learning. This would mean that higher

Conceptual Level will facilitate the processes involved in foreign language learning. The possible importance of all these factors in foreign language learning will be studied and analyzed in the present research.

CHAPTER 2

METHOD

The main objective of the present research was to study and analyze the relationship between nonverbal intelligence and foreign language learning. As foreign languages English and Swedish were chosen in Finland, English in India. That nonverbal intelligence is a powerful predictor in formal foreign language learning has got support from experiments by Genesee & Hamayan (1980), Flahive (1980) and d'Anglejan & Renaud (1985). They all employed Raven's Progressive Matrices together with foreign language test batteries and found inductive reasoning to be an important factor in foreign language learning. Their findings are, however, either based on very small samples or deal with adult students. Therefore additional research is needed to confirm the relationship found by them.

Different levels of conceptual development can be assumed to be connected with reasoning abilities. Therefore also the relationship between foreign language learning and conceptual level was examined in the present study. This relationship has got support from studies by A-L. Leino (1980, 1981, 1982). In order to measure conceptual level she employed Hunt's Paragraph Completion Method test (PCM). Conceptual level is defined by Hunt (Hunt et al. 1978, 3) in terms of increasing conceptual complexity and interpersonal maturity.

Learning the correct use of grammar in one's own mother tongue as well as learning mathematics can also be assumed to require both verbal and nonverbal intelligence. Therefore the relationship between them and foreign language learning was also studied. The relationship between reasoning and mother tongue learning has been investigated by Laurinen (1985). She found that the ability to make causal inferences is a powerful predictor of text understanding among elementary school pupils.

2.1. Objectives and Design of the Study

In order to study the relationships discussed above the following questions were formulated:

1. Is there a difference in foreign language learning outcome between pupils having different levels of nonverbal intelligence?
2. Is there a difference in foreign language learning outcome between pupils possessing different degrees of conceptual level?
3. Is sex an important factor in foreign language learning at elementary school level?
4. Is there a relationship between foreign language learning and (a) mother tongue learning, (b) learning mathematics?

The main objective of the present research was to study the contribution of nonverbal intelligence to foreign language learning. The design of the study was based on the following assumptions:

Nonverbal intelligence is normally distributed in a given population. Its contribution to foreign language learning can be brought out by adopting statistically viable strategies. It is further assumed that measures of foreign language learning can be obtained by testing the population with a number of tests.

The strategies adopted to bring out the contribution of nonverbal intelligence to foreign language learning were as follows:

1. To break up the population under study into three subgroups corresponding to the distribution of non-verbal intelligence. For this purpose the following statistical cutoffs were made:

Low in nonverbal intelligence - all subjects who scored Mean minus 1 SD or less.

High in nonverbal intelligence - all subjects who scored Mean plus 1 SD or higher.

Average in nonverbal intelligence - all subjects who fell in between these two cutoffs, i.e., Mean minus 1 SD and Mean plus 1 SD.

These three groups were compared with each other on the performance measures obtained in the foreign language test.

2. To study the contribution of various parameters of nonverbal intelligence to foreign language learning. The objective was to find out which of these parameters contributed most.

3. To study if the various parameters of nonverbal intelligence contribute equally to the foreign language learning outcome of the three following subgroups:

   Low score in the foreign language test - all subjects who scored Mean minus 1 SD or less.

   High score in the foreign language test - all subjects who scored Mean plus 1 SD or higher.

   Average score in the foreign language - test all subjects who fell between these two cutoffs, i.e., Mean minus 1 SD and Mean plus 1 SD.

2.2. Sample

The total sample for the present study consisted of 768 subjects, 600 from Finland and 168 from India. Of the 600 Finnish subjects 321 were male and 279 female elementary school children from grade 6, age group 12-13 years.

All the Finnish children spoke Finnish as their mother tongue, and were studying their first foreign language (English = 352, Swedish = 248) for the fourth year. The first foreign language, compulsory for all children, starts in grade 3 when the children are 9-10 years. The Finnish sample was taken from ten schools (42 study groups) in Helsinki on the basis of stratified sampling. The schools picked out for the study were judged to be typical of the population, representing all social classes approximately in the same proportion as they appear in the city concerned. The foreign language the children were studying was not spoken as their native language by any of the parents concerned.

The scheme for the sampling is given in Figure 10.

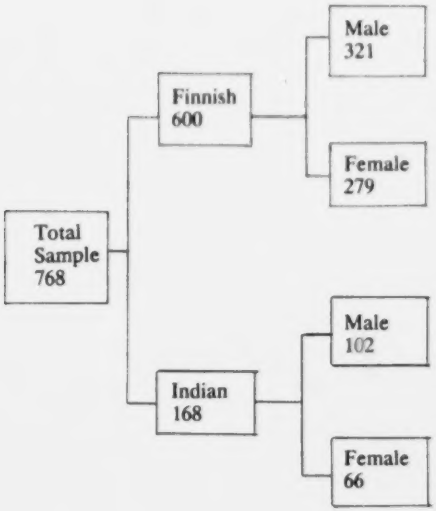

Figure 10. The sampling scheme

The Indian sample consisted of 168 subjects, 102 male and 66 female school children from grade 8, age group 12-13 years. It is to be noted that Indian children start school two years earlier than Finnish children. All the Indian children spoke Hindi as their mother tongue. They had studied English from grade 1. The Indian sample was taken from four (central) schools in Delhi (one class from each school). The central schools were chosen because they provided a fairly uniform standard throughout India. Moreover, the children going to these schools come from a relatively homogenous background. They come from homes where the parents can read and write and are thus moderately educated.

It is of importance to note that the objective of the present study was not to compare the two samples (Finnish and Indian) in their foreign language ability. The main objective was to investigate whether the same mental processes were involved in poor and good foreign language learning, regardless of the children's mother tongue. Differences in the learning outcome would, however, be dealt with where they give additional insight into foreign language learning in general. There are several reasons why direct comparison between the learning outcomes is not meaningful, probably not even possible: the Hindi alphabet is different, conditions in the schools concerned differ greatly, the average size of the study groups in Finland was less than 15 pupils, in India 45 pupils, in India children from well educated homes often go to private schools, etc.

2.3. The Measuring Instruments

2.3.1. Raven's Progressive Matrices Test

To measure the pupils' nonverbal intelligence Raven's Progressive Matrices - Standard form (revised in 1983) was used. The test measures a person's capacity to understand figures shown to him, see the relations between them, conceive the nature of the figures by completing each system of relations presented and, by doing so, develop a systematic method of reasoning (Raven et al. 1983, 2). As reasons for choosing this test can be mentioned its reliability and validity in a wide variety of non-English-speaking settings, and the fact that it is completely

language free. The manual of the test provides details of the reliability and validity well established during the last 45 years.

Raven's Progressive Matrices test is often referred to as a test of abstract intelligence because it requires reasoning without any verbal material included. Indirectly, however, language is involved when reasoning by oneself. According to Raven the test is sufficiently long to assess a person's maximum capacity to form comparisons and reason by analogy (without being unduly exhausting or boring). Raven also describes the scale as a test of observation and clear thinking, and stresses that **it is not by itself a test of 'general intelligence', and that it is always a mistake to describe it as such**, as has been done by numerous researchers. The test requires primarily analogical and inductive reasoning, but also memory is involved (for a detailed analysis of different kinds of reasoning see e.g. J. Leino 1981; Sternberg 1982; Johnson-Laird 1985; Pellegrino 1985).

It was also decided to use Hunt's test of conceptual level because it is generally accepted as a measure of different levels of conceptual development and increasing conceptual complexity.

2.3.2. Hunt's Paragraph Completion Method Test

The Paragraph Completion Method test (PCM), developed by Hunt et al. (1978), was used to assess the conceptual level of the subjects. It is a semiprojective test in which the completion responses are considered to reflect how a person thinks. The test also measures interpersonal maturity as indicated by self-definition and self-other relations (Hunt et al. 1978, 3). It also shows the pupil's need of structure in teaching.

The PCM test consists of six incomplete sentences. The subject is asked to complete them by writing at least three sentences on each topic. School children are allowed three minutes per item. The topics are:

1. What I think about rules ...
2. When I am criticized ...
3. What I think about parents ...
4. When someone does not agree with me ...
5. When I am not sure ...
6. When I am told what to do ...

The responses are assumed to show how the respondent handles conflict of uncertainty, and how he thinks about rule structure and authority relations. In the instruction it is clearly told that there are no right or wrong answers, and that the subject should give his own idea and opinion about each topic.

The manual provides sufficient information to learn to score the PCM. In learning to score one needs a clear idea of the characteristics of thinking at different levels of conceptual development. While scoring the judge should also at every response remember the general definition of conceptual level in terms of:

(1) increasing conceptual complexity as indicated by discrimination, differentiation, and integration,
(2) increasing interpersonal maturity as indicated by self-definition and self-other relations (Hunt et al. 1978, 3).

A score from 0-3 is given to each of the six responses. After this the total CL score is calculated by averaging the highest three responses. The rationale for using the top three is that if a person demonstrates a high level of conceptual thinking on a few responses, he is not required to do so every time. The mean of all the six responses is, however, needed when one is concerned with identifying persons with scores below 1. If there are fewer than three scorable responses, then the protocol is considered unscorable. Although PCM can be used with post-secondary samples, the manual was developed primarily for grades 6-13. The reliability of PCM has generally been calculated by the test-retest method, as internal consistency indices are found to be inappropriate for CL scores according to the manual. The rationale for this is the nature of the responses and that usually only the three top scores but in some cases six are

used. One year test-retest reliability coefficients are according to the manual between .50 - .58 (grades 7-11), and .67 for three months (college students). The manual summarizes the inter-rater reliability coefficients from 26 studies. The median inter-rater coefficient is .86. To provide construct validity for CL, intellectual ability has according to the manual almost always been controlled as well as classroom achievement.

2.3.3. The Foreign Language Test

Communication depends on the speaker's and the listener's knowledge. General knowledge is needed for interpreting communication, but something else must be involved in being able to speak, read, and understand any language. Yet communication is easier if the speakers share a lot of knowledge. If this communication, however, goes on in a language foreign to one or both of the speakers, then both, in addition to shared knowledge, must understand the language of the discourse - and also make themselves understood. In addition, it is not enough that they both activate an appropriate schema, frame or script in the memory, they also have to be able to generate inferences which go beyond the actual words and sentences expressed. Language users are usually not interested in linguistic decisions while speaking, rather they seem to be conveying thoughts directly, presenting the content of arguments. The purpose of talking is to say what we mean.

Learning a new language involves learning a whole linguistic system including vocabulary, grammar, idioms, and conversational conventions. In the present study the emphasis is not on how this linguistic and general knowledge is stored in memory but on what actually has been stored, and whether it can be retrieved from memory when needed. The investigation also tries to find out some of the mental processes which are responsible for the production and comprehension of individual utterances expressed in the target language, and in how people differ in these abilities. The exact relationship between linguistic skills, general knowledge and communication is not yet very clearly understood. Our understanding of language comprehension has, however, improved considerably. Also computer models have revealed important aspects in

language understanding and production by e.g. showing that analysis of sentences should be based on the extraction of meanings, by passing the need for a separate stage of syntactic processing. The programs actually try to ignore syntax as much as possible.

When preparing a language test there are two major questions that must be answered. As discussed above, language often means communication. The first question to be answered then is: Do we want to test primarily language or primarily communication? The second question concerns the test construction: What kind of test should be used? This question again can be answered only when knowing what is to be measured. In the introductory part it was discussed, referring to several foreign language learning theories, how in practice it has not been possible to produce a single theory which alone would explain communicative competence. For at least some general command of the correct use of grammar this has been easier. The main interest in a modern society where foreign languages are being taught to large populations lies, however, in communicative abilities. Also foreign language learning curricula in different countries stress communicative competencies on the basis of direct lack of them and need of them. At elementary levels also the age and cognitive development of the learners favor communicative abilities. In general, it can also be pointed out that some areas of linguistic competence are essentially irrelevant to communicative competence while linguistic competence always is a part of communicative competence (Allwright 1979). For the reasons discussed, in the present study the test used was constructed primarily to test pupils' communicative abilities without ignoring the grammar included. As the aim was to study the same abilities in different cultural settings, a large population had to be tested, which again made oral testing impossible. It is, however, possible to test some oral proficiency in writing (see e.g. Hellgren 1982). In an innovative field experiment Hellgren tested the hypothesis of the unitary structure of English proficiency by means of a test, in which oral and written responses were given, in a restricted time, to questions about the contents of the interview heard on tape. The subjects (N=406) were of ten senior secondary schools in Finland, drawn through stratified sampling. They were matched by means of a cloze test, and the matched pairs answered the same questions in the different modes and changed their answering modes in the second part of the test.

Differences between written and oral responses were investigated through an analysis of variance and through factoring into a two-factor solution. The hypothesis of the unitary structure of English proficiency was supported by the results. The test proved a reliable and valid instrument with an asset of simplicity. Pronunciation and intonation cannot be tested in this way, and they have also in some studies been shown to be separated from general foreign language proficiency.

The advantage of a written version for testing oral proficiency is of great importance when a large number of testees have to be examined. In the present study nearly 800 students had to be tested, and for the reasons discussed a written test was constructed to measure as far as possible both oral and written communicative proficiency. In this research communicative proficiency in a foreign language can be operationalized into discourse processing. Evaluating it requires productive performance.

The test used in the present study could also be said to measure both achievement and proficiency, because what had been taught was measured, but also the aim was to get some idea of the general proficiency level of both good, average and poor performers. Thus the global foreign language skill of the learners, how well they can handle the language on different occasions, what kind of communicative abilities they can master was measured. For these reasons an integrative test was chosen as the measuring instrument. Emphasis in integrative-sociolinguistic tests is on the assessment of the total language proficiency, both comprehension and production. The term stems from psycho-linguistics and sociolinguistics, and the approach is concerned not only with the ability to communicate in a given situation but also with the creative aspect of the languge. How discrete-point tests are distinguished from integrative skills tests can be seen in a scheme presented by Oller (see Figure 11).

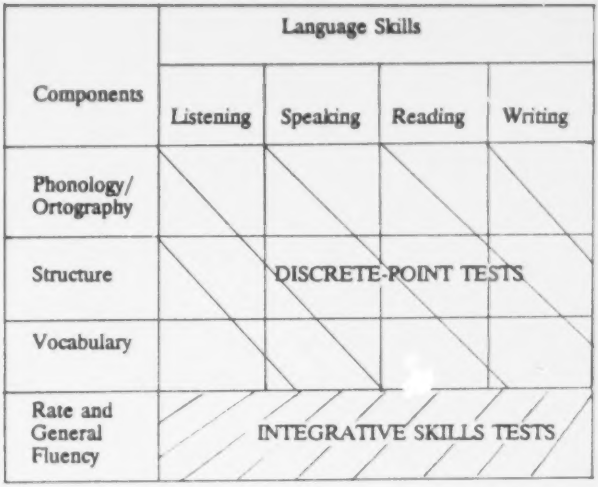

Figure 11. A scheme of language tests (Oller 1973, modified from Harris 1969).

Oller's (1973) view of integrative language skills tests is similar to that of e.g. Carroll's (1972) and Spolsky's (1976). They all criticize discrete-point tests because they might show that the student knows the language at a certain level, but not whether he can use the language in communicative situations.

Description of the language test

Since there are no standard foreign language tests that would have been suitable for the study, the experimenter had to construct the whole test by herself. Following the basic principles of test construction, easy and difficult items were included aiming at a normal curve. The test consisted of two main parts: comprehension and production. Both parts contained several subsections. The test was planned to meet the following requirements: It should be able to measure the pupils' comprehension of the target language in communicative

everyday situations, as well as their ability to produce understandable language in similar situations. The aim of the test was not to measure understanding of complicated expository text; instead, simple everyday conversational speech was presented in written form.

Because communicative abilities were tested, the test did not employ isolated words as such. Research done on language comprehension shows something of a paradox. Instead of small linguistic units like words and phrases being easier to understand, it is actually easier to interpret whole sentences than individual words, and to understand whole texts rather than single sentences (e.g. Greene 1986). Some idiomatic frequently occurring phrases in everyday speech make an exception. When trying to understand stories it has been shown that the more a story conforms to the 'ideal' structure, the easier it is to understand. Leaving out crucial elements like the theme or altering the order of the story components makes stories harder to understand (Thorndike 1977).

THE COMPREHENSION PART

The comprehension as well as the production part contained both easy and fairly difficult items. The instructions were given in the pupils' mother tongue, in India also in English. The English versions are given in the examples below. There were three subsections in the comprehension part.

SUBSECTION I

Matching questions and answers in a conversation between two school boys talking in the schoolyard. When the correct answers are found, the conversation is completed. The theme was chosen to interest especially boys, who in lower grades have frequently been found to be less interested in (foreign) language studies. The situation is clearly explained in the instruction given. This procedure is supposed to activate the corresponding schema in memory, which again should help in solving the task. Two more answers than questions are given in order to eliminate a problem already solved when arriving at the last

item. When beginning the task, there are thus 12 possible answers to choose the right one from. Subsection I is presented below. The conversation begun here goes on in the following task.

I *Two school boys are talking in the schoolyard. Which questions and answers go together? Write the number of the question in the empty square next to the right answer. Two squares will remain empty. Put a circle round the number of the question you have already answered.*

	☐ Because I had no time.
	☐ I don't know. Why not a football?
1. Did you go and see John yesterday?	☐ This is our garden.
2. Why didn't you?	☐ No, I didn't.
3. Where were you then?	
4. Do you often have guests?	☐ At home, cleaning the house. Some people were coming.
5. Must you help your mother every day?	
6. When is your birthday?	☐ No, I'm not. He is much better.
7. What do you want as a present?	☐ The team my brother plays in.
8. Why isn't Tom at school today?	
9. Did you watch TV last night? Who won the football game?	☐ Yes, they are made of rubber.
	☐ He's ill. I think.
10. Are you as good as he is?	
	☐ Yes, both friends and other people.
	☐ On the sixth of June.
	☐ No, I needn't. But I like to.

SUBSECTION II

The same boys are still talking, but now school is over for the day and they are standing in the street looking at a house and a big lorry standing nearby. It is supposed that a test is more interesting if the different sections are not completely separated from each other but instead connected by a theme. There are ten gaps, which have to be filled with words chosen from 15 given possibilities. Guessing is reduced to a minimum by the fact that there are 10 gaps but 15 words. Only ten suit the gaps:

II *Now the boys are standing and talking in the street. What does one of the boys tell his friend? Fill in his story with words from the box. Five words will be left unused.*

Look, there is a _____lorry standing over there. _____ uncle Jack _____ in that house, and it is his _____. He needs a new one, but he hasn't got _____ money to buy one. Tomorrow uncle John will _____ _____to Kashmir. He often goes there, and _____ sleeps in his lorry. It is _____ to stay in a hotel, he says. Next _____ he will take me _____ him.

lorry, my, lives, quite, expensive,
why, where, love, ice-hockey, big,
drive, summer, enough, with, sometimes

SUBSECTION V

In this section a situation was created where a guest is arriving from far away and telling the family about the journey. Her narration is given in the target language and it was to be translated into the pupils' mother tongue. Tasks III and IV were productive tests. The whole test thus began with comprehension tasks which were supposed to be easier for poor performers to begin with.

V *An English-speaking friend of yours has come to visit you. She is telling you about the trip. Not everybody in your home understands English, so that you must translate what Mary says into your own language.*

1. I only had a second class ticket, but the trip was quite all right anyway.

_____

_____

2. There were so many people on the boat.

_____

_____

3. It was rather cold, because there was a strong North wind.

_____

_____

4. We ate nice sandwiches and drank lemonade. Some people were eating all evening, I think.

_____

_____

5. I met several nice people. We sat up talking half the night.

_____

_____

6. It was a fine trip. Tomorrow I must buy some postcard and send them to my friends.

_____

_____

7. Is there a post-office near here? I'm sure they'll have some beautiful stamps.

_____

_____

THE PRODUCTION PART

There were four subsections in the production part. In sections III and IV the testees were encouraged to use their imagination and creativity. These parts are, however, easier than the other two production parts (VI and VII). Including pictures and story-telling they were supposed to motivate even the poor performers to write at least a few familiar content words. Also the placement of these before the last comprehension part was done on purpose. Placing all the productive items after each other was not considered advisable.

SUBSECTION III

This task contained four pictures, and the pupils were asked to write a story of their own based on the picture series. In addition to the written instruction they were told that the main character seen in the pictures can be a boy or a girl, and that in addition to what can be seen in the picture series they can invent additional things connected with the story: place, time, who the persons are, etc. Thinking of the poorest performers, the pupils were encouraged to write even single words related to the pictures if nothing else.

III *What is happening? Write about the pictures. Continue on the other side of the paper if necessary.*

1 _____

2 _____

3 _____

4 _____

SUBSECTION IV

The fourth section is slightly easier than the third. This was done on purpose so that also poorer performers would at least try to say something of their own at a time when they were not yet supposed to have become too tired. It was supposed that when arriving at section four they would feel the situations presented in the pictures very familiar and would like to write something about them. The vocabulary involved here is fairly concrete and the situations are taken from pupils' everyday life: reading a book/doing homework, watching TV, eating/drinking/having breakfast, etc. Also here the use of imagination was encouraged.

IV *Write in English what Mary did over the weekend. Write under the pictures.*

1 _____ 2 _____ 3 _____

4 _____ 5 _____ 6 _____

SUBSECTION VI

This section is a direct continuation of section V. The guest who has arrived is being asked a lot of questions about her family, journey, habits, plans for the visit, etc. The text was given to the pupils in their mother tongue (Finnish or Hindi), and they had to translate it into English. It was stressed that the translation need not be verbatim and that the most important thing was that they could express in English the main message of the conversational sentences. In this section primarily the **ability to ask questions** in the target language was tested. Most of the content words involved were supposed to be familiar even to poor performers. Easiness of vocabulary was considered important, as forming questions is a difficult task in itself.

VI *Your mother wants to ask your friend something. Translate what she says into English.*

1. Miten sinun vanhempasi voivat? ... Etc. (=Finnish)
   ... Etc. (=Hindi)

   How are your parents? (=the English translation)

   _____

   Are you very tired after the journey?

   _____

2. Do you usually read in bed?

   _____

   You can have a lamp.

   _____

3. What would you like for breakfast?

   _____

Do you drink milk, juice, or just water? Coffee or tea?

_____

_____

4. How long can you stay here?

_____

What do you want to do tomorrow?

_____

5. Would you like to go to the river?

_____

You can take Ashok's bike. It's quite new.

_____

_____

SUBSECTION VII

The last section of the test requires both understanding and production as well as ability to make inferences. It is of the cloze-type, but more directly tests language ability because the beginnings of the missing words are given. By giving the beginnings of the words the test is made easier. This was considered important, regarding the age of the testees. In addition, there is still no general agreement about what the cloze test in its original form (where every ninth word is omitted) measures (see e.g. Hellgren 1986).

The last three sections of the whole test (**V, VI** and **VII**) complete a full story in continuation. Thus the whole test is not only a test in separate parts but contains different kinds of discussions and stories with a common theme in them. This kind of approach in test construction was used in order to create interest in what is being said and what is happening and in this way try to keep the pupils interested through the whole test.

VII *Fill in the story about what happened in the forest during the bike trip.*

"My friend and my sister cycled back ho _____ earlier th_____ I did. I sta_____ in the forest by the river. There were so ma_____ big trees! I wal_____ there for a long ti_____. When I was on my way ba_____ to my bike, I sa_____ a big ani_____ beh_____ a tree! It was loo _____ at m_____. I hope it is not hun_____, I thought! I was very much afr_____. I sta_____ running and finally ca_____ t_____ the river. But my bike wasn't there. I then jum_____ into the water and swam far away, with a_____ my clothes on! Now I know th_____ the big animal was a bear/tiger!"

SCORING THE FOREIGN LANGUAGE TEST

The total maximum score of the language test was 240, divided equally between the comprehension part and the production part (120 + 120 respectively). In the **comprehension part** the individual scores for each item and the maximum score for each subsection were as follows:

SECTION I 10 x 4 = 40 (matching questions and answers)
SECTION II 10 x 2 = 20 (choosing right words for gaps)
SECTION V 5 x 12 = 60 (translation into mother tongue)
(Sentence 1 = 12, 2 + 3 = 12, 4 = 12, 5 + 6 = 12, 7 = 12)

In the translation section the maximum score for each sentence was arrived at on the basis of the amount of information given in it. Thus the length of the sentence and the number of content words played a big role. Scoring was based on understanding the message given in the sentence concerned. Generally one point was detracted for each wrong content word, yet at least half of the maximum score was given if the main message of the sentence was understood.

In the **production part** the scores were as follows:

SECTION III 4 x 3 = 12 (story-telling, based on pictures)
SECTION IV 2 x 1 + 4 x 1,5 = 8 (describing a pupil's day; pictures)
SECTION VI 3 x 12 + 10 + 14 = 60 (translation into the target language)
(Sentences 1,3,4 = 12 each, 2 = 10, 5 = 14)
SECTION VII 20 x 2 = 40 (modified cloze: beginnings of words given)

The rationale behind the scoring was the same as in the comprehension part. In all individual items also in the production part at least half of the maximum score was given if the message of the sentence was expressed understandably. Generally one point maximum was detracted if a content word was missing, and only 1/4 - 1/2 point for an error or a mistake in grammar. All syntactically and semantically suitable alternatives were accepted as correct, and awarded with one point. Thus a so-called contextual method of scoring was followed. The whole scoring aimed at evaluating communicative abilities.

2.4. Pilot Study

Before planning and conducting the final experiment a pilot study was carried out in two Finnish schools. The subjects were pupils from the same grade level as in the main experiment. There were 57 subjects - 29 boys and 28 girls.

On the data obtained an item analysis was carried out. Cronbach alpha was found to be .92 showing high internal consistency of the test. The items were found to differentiate well both in the comprehension part and the production part. The correlation between the test scores and the grades given by the foreign language teacher was found to be highly significant ($r = .83$). Also, the boys were found to score significantly ($t = 4.1$ for $df = 55$) lower than the girls.

The pupils were also tested with Raven's Progressive Matrices test and with Hunt's test of conceptual level. The scores of both the tests were found to correlate significantly with the language test scores. The correlation between the language test and Raven's test was .70, and between the language test and Hunt's test .55.

The instructions of the different subsections of the test did not cause any misunderstanding. Two boys and one girl wanted the experimenter to come to them to check that they had understood the instructions correctly, which was also the case.

2.5. Procedure

The Main Study

The main study was carried out in different schools during the same term in Finland and in India. In India an experienced researcher in psychology was trained in advance for testing the pupils. The foreign language test was based on material taught in both countries. The text and the quality of all the different subsections were considered by the Indian teachers to be suitable also for the Indian children. No changes in the language test were required (except *bear/tiger*). So it was decided to present the test in its original form. The

Swedish version was made as similar to the English as possible. To equalize the test situation for all the pupils it was considered necessary that the experimenter was present when giving instructions and also when the pupils were engaged in taking the tests. When parallel classes had to be tested simultaneously, the experimenter was in one of the classes and could be consulted by the other class whenever needed. The teachers were also trained in giving guidance. Convenient dates and times were agreed on with the teachers concerned.

The order of the presentation of the different tests was as follows: Raven's Progressive Matrices test and Hunt's Paragraph Completion Method test were given first, the foreign language test some time later. A time interval was considered necessary because of the length of the tests and also because all the tests were taken during the pupils' ordinary school hours. This procedure minimized the number of absentees. Those few who were absent took the test as soon as they came to school. While taking the tests the pupils were encouraged to ask questions whenever there was something in the instructions that they could not understand. In addition, thinking of slow or poor learners, the experimenter walked during the test from pupil to pupil in order to check that everybody really had understood what was to be done. The experimenter, as well as all the teachers, knew from their own experience that some pupils tend to give up too easily when working with tasks including also difficult items. For this reason the subjects were not allowed to leave the classroom early. Those pupils who, however, tried to give their answer sheets too early, were asked to go back to their seats and check everything once more. When receiving the papers, the experimenter tried to check that everything was properly done.

By far most of the pupils had a very positive attitude to the tests. In the administration of the different tests the instructions for using them were closely followed. The manual for the conceptual level test stressed that the investigator should expand instructions for each item according to the testees' age, in this case school children. Therefore, when coming to the item about rules the following should be added: "Write all you can on how you feel about rules, not just the rules here at school but all rules." (Hunt et al. 1978, 2.) It was also stressed that only the investigator would see the answers. It was, in fact, noticed that many of the troublemakers clearly enjoyed taking the test probably because

they for once could freely express their aggressive feelings - even if only in writing.

The new manual from 1983 for Raven's Progressive Matrices test was followed when giving the test. The manual was also followed when finding discrepancies of more than 2 in different parts of the test. If a person's score on one of the sets deviates by more than 2, his total score on the scale cannot be accepted at its face value as a consistent estimate of his general capacity for intellectual activity (p. 16). For general purposes the total score appears according to the manual to be relatively valid even when discrepancies of more than 2 points occur in the break-up. The interest of this research lay, however, precisely on the answers of those pupils who according to the manual (and also according to the researcher's earlier experience) produce inconsistent answers, i.e., poor performers. For this reason it was considered necessary to retest all the pupils whose scores on any of the sets deviated by more than 2 from the score expected. This meant an additional visit to the school for the investigator, and similarly an extra working hour for the pupils concerned. None of the pupils with discrepancies refused to take the test again. Instead all of them, especially poor performers, seemed to feel more confident when doing it again, and also performed consistently.

The manual for Progressive Matrices stresses the importance of giving the test without any time limit. This requirement was met. In practice, however, most of the testees finished it within 45 minutes, and even the slowest ones in one hour. In all there were three cases when a subject wanted to work a little longer, and they were allowed to do so. When receiving the answer sheets the experimenter checked that all the items had been answered. Nobody was allowed to leave without finishing the test.

All the pupils who had discrepancies of more than 2 points were interviewed after having taken the test again. This was considered important both from the reliability point of view and also in the hope of finding out why the person's performance was not consistent. The answers are listed below (in order of frequency):

- I was in a hurry ..... (I had to go to a football game, my piano lesson, see a friend of mine, the doctor at school, go to a party).
- When I came to the difficult parts, I didn't care so much whether I did it wrong or right.
- At the beginning I didn't quite understand the system and I didn't care to go back to the first parts and check them.

The answers above show how important it is that the situation when the test is given is favorable for taking the test. They also show that the test has some learning potential value: There are pupils who at the beginning do not understand the relationships between the figures properly but who little by little are able to learn. This finding might be of value when selecting pupils for remedial teaching: some pupils are able to learn the system with practice given by taking the test twice, some are not. In psychological testing it was earlier generally considered a drawback if a test is susceptible to practice effect. Especially in groups with very dissimilar backgrounds the test has been found to be susceptible to considerable practice effect (Anastasi 1982, 290-91). This could, however, possibly also be expressed in terms of considerable learning potential.

As with the other tests, the experimenter was always present when the foreign language tests were taken except when there were several parallel classes simultaneously taking the test. To complete the test 60 minutes were allowed. At the beginning it was ensured that everybody had understood what was to be done. In the first subsection the pupils were asked to circle the number of the question they had already answered. In the second subsection they were asked to cross out the word they had already used. This procedure made it easier to fill the gaps still empty. In the remaining subsections the pupils were encouraged to write even a few words if they thought they couldn't write full sentences. It was stressed that also single content words were of value. When the pupils delivered the test papers to the examiner, she tried to make sure that all subsections were properly done. If not, the pupils concerned were asked to go on working.

CHAPTER 3

RESULTS

The data consisted of the comprehension and the production scores as measured by the foreign language test employed, the nonverbal intelligence scores, and the conceptual level (CL) scores.

3.1. The Finnish Sample

3.1.1. Nonverbal Intelligence and Foreign Language Learning

Mean and standard deviation of the scores of nonverbal intelligence for the 600 Finnish subjects were calculated and were found to be 46.29 and 6.94 respectively. The distribution of the scores was broken up to generate three subgroups according to the following cutoffs. Those subjects who scored 1 standard deviation or more below mean were taken as low in nonverbal intelligence; those who scored between mean and ± 1 standard deviation were taken as average in nonverbal intelligence; and those who scored 1 standard deviation or more above mean were taken as high in nonverbal intelligence. The corresponding comprehension scores and production scores of each of the subjects in the above three subgroups constituted the data for the analysis under this section.

Comprehension

One way analysis of variance (ANOVA) was carried out for the unequal groups on comprehension scores of the three subgroups. The three groups were found to differ significantly on the scores, $F(2,597) = 38.63$; $p < .01$. The mean comprehension scores of the low, average, and high nonverbal intelligence groups were 38.59, 90.15, and 110.47, respectively (Fig. 12).

Table 1. Summary of comprehension scores for the three nonverbal intelligence (NI) subgroups

Groups	N	Mean	F	p
Total Sample	600	84.98	38.63	<.01
Low NI	87	38.59		
Average NI	447	90.15		
High NI	66	110.47		
Female Sample	279	92.10	17.89	<.01
Low NI	35	41.60		
Average NI	202	90.54		
High NI	42	112.83		
Male Sample	321	78.79	19.95	<.01
Low NI	51	36.08		
Average NI	232	83.91		
High NI	38	104.84		

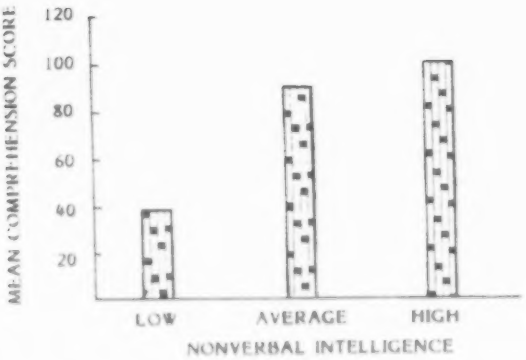

Figure 12. Mean Comprehension scores of the low, average and high nonverbal intelligence sub-groups in the Finnish sample

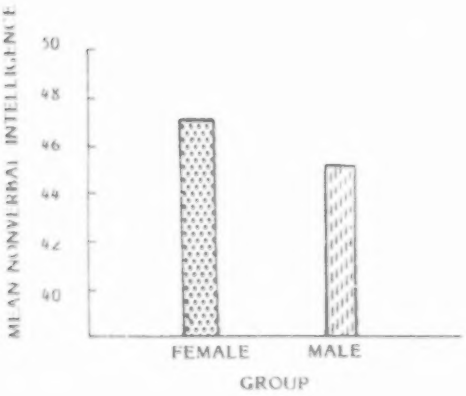

Figure 13. Mean nonverbal intelligence scores of the female and male subjects in the Finnish sample

Comprehension - Sex as a Factor

The entire sample was broken up into males and females to find out the sex differences in nonverbal intelligence and comprehension scores. The female subjects showed significantly higher nonverbal intelligence than the male subjects ($t = 3.57$; $p < .01$). The mean nonverbal intelligence score of the female subjects was 47.36 (SD = 6.62), and that of the male subjects 45.36 (SD = 7.08) (Fig. 13).

On the basis of the same criterion Mean ± 1 standard deviation, as used for the total sample, three subgroups were generated using nonverbal intelligence scores, for females and males separately. One way analysis of variance for unequal groups was carried out using the comprehension scores of these subgroups.

ANOVA carried out on the three subgroups of the female subjects showed that the subgroups differed significantly in comprehension, $F(2,276) = 17.89$; $p < .01$. The mean comprehension scores of the low, average, and high nonverbal intelligence subgroups were 41.60, 90.54, and 112.83, respectively (Fig. 14). ANOVA carried out on the three subgroups of the male subjects showed that the subgroups differed significantly on their comprehension scores, $F(2,318) = 19.95$; $p < .01$. The mean comprehension score of the low, average and high nonverbal intelligence subgroups were 36.08, 83.91, and 104.84, respectively (Fig. 14).

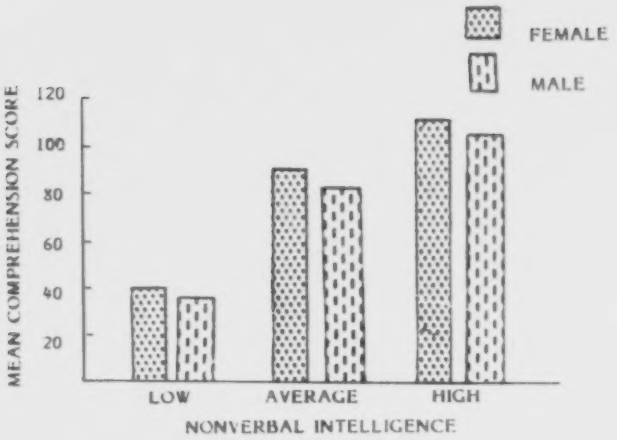

Figure 14. Mean comprehension scores of the low, average and high nonverbal intelligence sub-groups for the female and male subjects in the Finnish sample

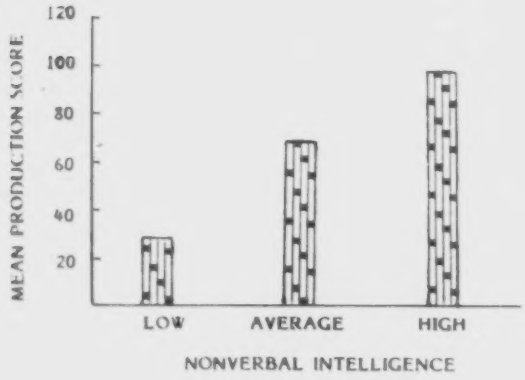

Figure 15. Mean production scores of the low, average and high nonverbal intelligence sub-groups in the Finnish sample

Production

Following the earlier criterion used for analyzing the comprehension scores (see beginning of Results), the three subgroups formed were also compared on the production scores. One way analysis of variance carried out for unequal groups showed that the three subgroups differed significantly, $F(2,597) = 107.77$; $p < .01$ (Table 2). The mean production scores of the low, average, and high nonverbal intelligence subgroups were 29.98, 69.45, and 96.82, respectively (Fig. 15).

Table 2. Summary of production results for the three nonverbal intelligence (NI) subgroups

Group	N	Mean	F	p
Total Sample	600	66.74	107.77	<.01
Low NI	87	29.98		
Average NI	447	69.45		
High NI	66	96.82		
Female Sample	279	73.64	68.02	<.01
Low NI	35	31.71		
Average NI	202	75.36		
High NI	42	100.31		
Male Sample	321	60.74	41.40	<.01
Low NI	51	30.35		
Average NI	232	62.83		
High NI	38	88.76		

Production - Sex as a Factor

ANOVA carried out on the three subgroups of the female subjects showed that the three subgroups differed significantly on their production scores, $F(2,276) = 68.02$; $p < .01$. The mean production scores of the low, average, and high nonverbal intelligence subgroups were 31.71, 75.36, and 100.31, respectively (Fig. 16). ANOVA carried out on the three subgroups of the male subjects showed that the subgroups differed significantly, $F(2,318) = 41.40$; $p < .01$. The mean production scores of the low, average, and high nonverbal intelligence groups were found to be 30.35, 62.83, and 88.76, respectively (Fig. 16).

3.1.2. Conceptual Level and Foreign Language Learning

The Mean and standard deviation of the scores of the conceptual level for the 600 Finnish subjects were calculated. The mean was found to be 0.95 with a standard deviation of 0.44. The distribution of the scores was broken up to generate three subgroups according to the cutoffs as follows. Those subjects who scored 1 standard deviation below the mean were taken as low in conceptual level; those who scored between mean ± 1 standard deviation were taken as average in conceptual level; and those who scored 1 standard deviation above mean were taken as high in conceptual level. The comprehension scores and the production scores of each subject in the above three subgroups constituted the data for analysis under this section.

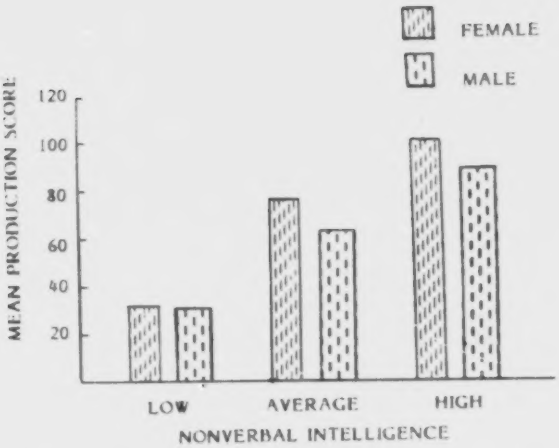

Figure 16. Mean production scores of the low, average and high nonverbal intelligence sub-groups for the female and male subjects in the Finnish sample

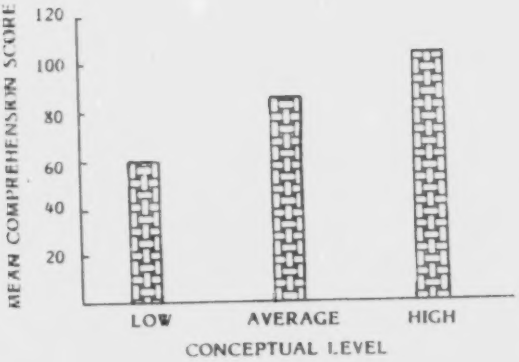

Figure 17. Mean comprehension scores of the low, average and high conceptual level sub-groups in the Finnish sample

Comprehension

One way analysis of variance (ANOVA) was carried out on the comprehension scores of the three unequal subgroups. The three subgroups were found to differ significantly on their comprehension scores, $F(2,597) = 15.40$; $p < .01$ (Table 3). The mean comprehension scores of the low, average, and high conceptual level subgroups were 60.42, 86.84, and 103.80, respectively (Fig. 17).

Table 3. Summary of the comprehension results for the three conceptual level (CL) subgroups

Group	N	Mean	F	p
Total Sample	600	84.98	15.40	< .01
Low CL	109	60.42		
Average CL	387	86.84		
High CL	104	103.80		
Female Sample	279	92.10	4.12	< .01
Low CL	58	73.69		
Average CL	184	95.21		
High CL	37	105.51		
Male Sample	321	78.79	13.08	< .01
Low CL	62	59.24		
Average CL	172	73.03		
High CL	87	104.11		

Comprehension - Sex as a Factor

The entire sample was broken up into males and females to test the significance of the sex factor on conceptual level. The female subjects were found to have a significantly higher conceptual level than the male subjects ($t = 10.00$; $p < .01$). The mean conceptual level score of the female subjects was 1.13 ($SD = 0.42$), and that of the male subjects 0.80 ($SD = 0.39$) (see Fig. 18).

On the basis of the same criterion as used for the total sample, i.e., mean ± 1 standard deviation, three subgroups were created using the CL - scores, for females and males separately. One way analysis of variance for unequal groups was carried out on their comprehension scores.

ANOVA carried out on the three subgroups of the female subjects showed that the subgroups differed significantly on their comprehension scores, $F(2,276) = 4.12$; $p < .01$ (Table 3). The mean comprehension scores of the low, average, and high conceptual level subgroups were 73.69, 95.21, and 105.51, respectively (Fig. 19). ANOVA carried out on the three subgroups of the male subjects showed that the subgroups differed significantly on their comprehension scores, $F(2,318) = 13.08$; $p < .01$. The mean comprehension scores of low, average, and high conceptual level subgroups were 59.24, 73.03, and 104.11, respectively (Fig. 19).

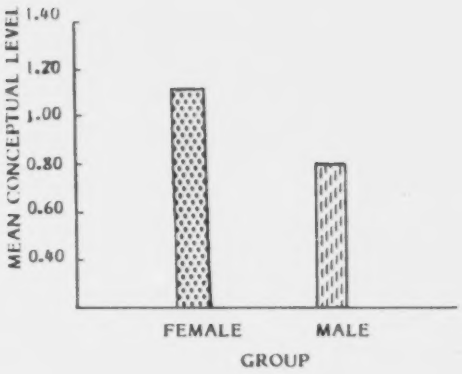

Figure 18. Mean conceptual level score of the female and male subjects in the Finnish sample

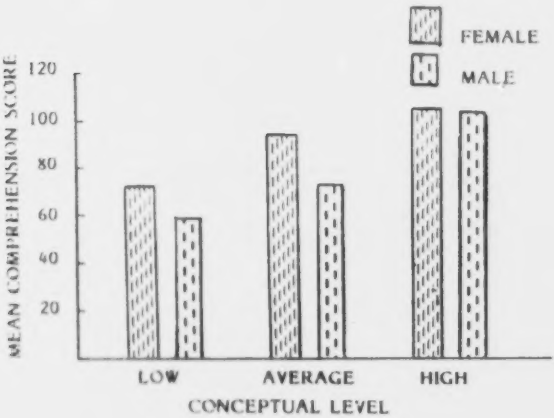

Figure 19. Mean comprehension scores of the low, average and high conceptual level subgroups for the female and male subjects in the Finnish sample

Production

On the basis of the criterion used earlier the three subgroups formed were compared on the production scores. One way analysis of variance carried out for the unequal groups showed that the three subgroups differed significantly in their scores, $F(2,597) = 52.84$; $p < .01$. The mean production scores of the low, average, and high conceptual level groups were 46.09, 66.33, and 89.91, respectively (Fig. 20).

Table 4. Summary of production results for the three conceptual level (CL) subgroups

Group	N	Mean	F	p
Total Sample	600	66.74	52.84	< .01
Low CL	109	46.09		
Average CL	387	66.33		
High CL	104	89.91		
Female Sample	279	73.64	14.05	< .01
Low CL	58	59.83		
Average CL	184	73.99		
High CL	37	93.54		
Male Sample	321	60.74	21.31	< .01
Low CL	62	46.03		
Average CL	172	56.87		
High CL	87	78.87		

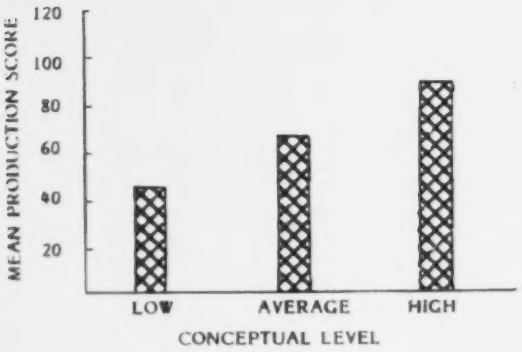

Figure 20. Mean production scores of the low, average and high conceptual level sub-groups in the Finnish sample

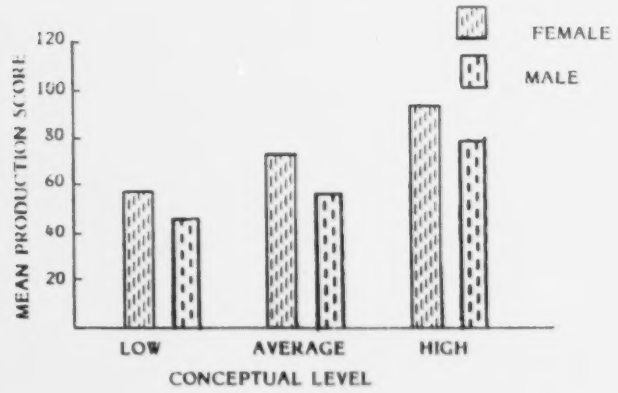

Figure 21. Mean production scores of the low, average and high conceptual level subgroups for the female and male subjects in Finnish sample

Production - Sex as a Factor

ANOVA carried out on the three subgroups of the female subjects showed hat the three subgroups differed significantly on their production scores, $F(2,276) = 14.05$; $p < .01$. The mean production scores of the low, average, and high conceptual level subgroups were 59.83, 73.99, and 93.54, respectively (Fig. 21). ANOVA carried out on the three subgroups of the male subjects showed that the three groups differed significantly on their production scores, $F(2,318) = 21.31$; $p < .01$. The mean production scores of the low, average, and high conceptual level groups were 46.03, 56.87, and 78.87, respectively (Fig. 21).

3.1.3. Regression Analysis

The data consisted of the comprehension and the production scores on the foreign language test, the nonverbal intelligence scores, and the conceptual level scores. The data also included the grades given by the teachers in school in mother tongue (I & II)*, mathematics, and the foreign language. Stepwise multiple regression analysis was carried out on the obtained data taking comprehension and production as dependent variables with nonverbal intelligence, conceptual level, mother tongue, and mathematics as independent variables. The summary of the results is presented in Tables 5a, b and 6a, b.

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* Mother tongue I includes reading, grammar, and literature; Mother tongue II includes fluency in oral and written work.

Table 5a. Summary of multiple regression analysis with the comprehension scores as dependent variable in the Finnish sample.

Variable	Multiple R	R^2	R^2 Change	Simple R	Beta
Nonverbal Intelligence	0.39	0.150	0.1499	0.3872	0.2895
Conceptual Level	0.40	0.160	0.0107	0.2478	0.0847
Mother Tongue I*	0.41	0.166	0.0053	0.3229	0.0792
Mother Tongue II**	0.41	0.166	0.0004	0.3066	0.0389
Mathematics	0.41	0.166	0.0001	0.2964	0.0151

*Mother Tongue I includes reading, grammar and literature
**Mother Tongue II includes fluency in oral and written work.

Table 5b. Percentage of variance accounted for predicting the comprehension scores of the subjects

Variable	% of Variance Accounted for	F	p
Nonverbal Intelligence	14.99	29.86	< .01
Conceptual Level	1.07	3.84	< .01
Mother Tongue I	0.53	1.12	NS
Mother Tongue II	0.04	0.30	NS
Mathematics	0.01	0.05	NS

The "R^2 change" can be interpreted as the portion of variance in the dependent variable accounted for by the regression equation. "R^2" shows cumulative percentage variance. "Simple R" is the correlation between the comprehension and respective independent variable. "Beta" values are normalized regression coefficients.

The multiple regression analysis showed that nonverbal intelligence contributed significantly towards the comprehension scores of the subjects, $F(5,594) = 29.86$; $p < .01$. Percentage of variance accounted for comprehension was 14.99. The contribution of conceptual level towards the comprehension score was also significant, $F(5,594) = 3.84$; $p < .01$. Its percentage of variance accounted for comprehension was 1.05. The other three variables, i.e., mother tongue I, mother tongue II, and mathematics accounted for 0.53, 0.04, and 0.01 percent of variance only, none of which was observed to be significant. It may be noted that nonverbal intelligence alone explains 14.99 % of variance in comprehension, and the gain with the other three variables was only 1.62 percent.

Regression analysis carried out assuming production as a dependent variable showed that nonverbal intelligence contributed significantly towards production, $F(5,594) = 111.76$; $p < .01$. Its percentage of contribution was 43.95 (see Table 6a, b).

Table 6a. Summary of multiple regression analysis with the production scores as dependent variable in the Finnish sample.

Variable	Multiple R	R^2	R^2 Change	Simple R	Beta
Nonverbal Intelligence	0.6629	0.4395	0.4395	0.6629	0.4292
Mother Tongue I	0.7075	0.5006	0.0611	0.6142	0.2492
Conceptual Level	0.7138	0.5096	0.0090	0.4088	0.1032
Mother Tongue II	0.7143	0.5103	0.0007	0.5637	0.0446
Mathematics	0.7143	0.5110	0.0000	0.5548	0.0096

Table 6 b. Percentage of variance accounted for predicting the production scores of the subjects

Variable	% of Variance Accounted for	F	p
Nonverbal Intelligence	43.95	111.76	<.01
Mother Tongue I	6.11	18.94	<.01
Conceptual Level	0.90	9.69	<.01
Mother Tongue II	0.07	0.67	NS
Mathematics	0.00	0.00	

Mother tongue I also showed significant contribution towards production, $F(5,594) = 18.94$; $p < .01$. Its percentage of contribution was 6.11. Conceptual level was also found to contribute significantly towards production, $F(5,594) = 9.69$; $p < .01$. Its percentage of contribution was 0.90. The other two variables, i.e., Mother Tongue II and Mathematics did not contribute significantly. It can be noted that nonverbal intelligence alone contributed 43.95 % of variance in production, and the other three variables together contributed 7.72 % for production.

It is interesting to note in the above results that nonverbal intelligence explained only about 15 % of the variance in the comprehension scores, whereas it explained about 44 % of the variance in the production scores. These results show a greater role of nonverbal intelligence in the production process than in comprehension. Another important observation may be made regarding the role of Mother Tongue in foreign language learning. Regression analysis showed that, even though Mother Tongue (reading, grammar and literature) did not contribute significantly to the comprehension of the foreign language, its contribution to the production of the foreign language was significant, and its contribution to production variance was 6.11.

The intercorrelation matrix generated for these variables is presented in Table 7.

Table 7. Intercorrelations between the different variable in the Finnish sample

	Comp.	Prod.	F.L. T.	N.I.	Conc. Level	MT I	MT II	F.L.G.	Math.
Comp.	-								
Prod.	.43**	-							
F.L. T.	.44**	.79**	-						
N.I.	.39**	.66**	.64**	-					
Conc. Level	.25*	.41**	.37*	.38**	-				
MT I	.32*	.61**	.59**	.64**	.45**	-			
MT II	.30*	.56**	.54**	.60**	.46**	.83**	-		
F.L. G.	.45**	.74**	.71**	.69**	.46**	.79**	.76**	-	
Math.	.29*	.55**	.52**	.66**	.35*	.76**	.74**	.72**	-

** p .01

* p .05

The high correlation between the foreign language test scores and teachers' grades (r_{tt} = .71) lends support to the validity of the foreign language test that was constructed by the investigator. Interestingly, the two parts of the test - comprehension and production - show similar relationship with the foreign language test scores and the foreign language grades separately. The correlation between comprehension and the total foreign language test was .44, between comprehension and foreign language grade .45; the correlation between production and the total foreign language test, .79, and between production and foreign language grade .74.

The whole sample of 600 Finnish subjects were subdivided into three subgroups (i.e., Low, Average, and High) on the basis of their comprehension scores following mean ± 1 standard deviation criterion. It was found that nonverbal intelligence contributed significantly to the scores of the poor performers (i.e., low in comprehension), $F(4,38) = 3.15$; $p < .05$. The percentage of its contribution was 9.58. In the case of average and good performers, however, the contribution of nonverbal intelligence was not significant. On the same lines, production score was taken as a dependent variable. It was found that the contribution of nonverbal intelligence was significant for the poor performers only, $F(4,113) = 2.02$; $p < .05$. Its percentage of contribution was 1.70.

Table 8. Mean and standard deviation of the male and the female subjects (Finnish sample) on different variables

	Maximum Score	Male (n=321) Mean	S.D.	Female (n=279) Mean	S.D.
Comp.	120	78.79	27.17	92.10	24.06
Prod.	120	60.74	34.34	73.64	31.66
F.L.T.	240	139.52	48.18	165.74	45.29
Nonv.Int.	60	45.36	7.08	47.36	6.62
Conc. Level	3	0.80	0.39	1.13	0.42
MT I	10	7.49	1.13	8.22	1.01
MT II	10	7.31	1.07	8.21	0.99
F.L.G.	10	7.27	1.35	8.04	1.31
Math.	10	7.47	1.32	7.98	1.26

3.2. The Indian Sample

The data consisted of the comprehension and production scores as measured by the foreign language test employed. In addition, the nonverbal intelligence scores, and the conceptual level (CL) scores were also available for the samples under study.

3.2.1. Nonverbal Intelligence and Foreign Language Learning

Mean and standard deviation of the nonverbal intelligence scores of the 168 Indian subjects were calculated. The mean was found to be 38.89 with a standard deviation of 7.88. The distribution of the scores was broken up to generate three subgroups according to the cutoffs which are as follows. Those subjects who scored 1 standard deviation below mean were taken as low in nonverbal intelligence; those who scored between mean and ± 1 standard deviation were taken as average in nonverbal intelligence; and those who scored 1 standard deviation above mean were taken as high in nonverbal intelligence. The corresponding comprehension scores and the production scores of each subject in the above three subgroups constituted the data for the analysis under this section.

Comprehension

ANOVA was carried out for the unequal groups on comprehension scores of the three subgroups. A summary of the results is presented in Table 9. The three subgroups were found to differ significantly on their comprehension scores, $F(2,165) = 47.65$; $p < .01$. The mean comprehension scores for the low, average, and high nonverbal intelligence groups were 78.81, 100.93, and 112.06, respectively (Fig. 22).

Table 9. Summary of comprehension results for the three nonverbal intelligence (NI) subgroups

Group	N	Mean	F	p
Total Sample	168	98.97	47.65	<.01
Low NI	32	78.81		
Average NI	102	100.93		
High NI	34	112.06		

The entire sample was broken up into males and females to test the significance of the sex factor in nonverbal intelligence. However, the difference between the male and the female subjects in nonverbal intelligence was not statistically significant (see Table 16).

Production

On the basis of the same criterion as used earlier, the three subgroups formed were also compared on the production scores. One way analysis of variance carried out for unequal groups (Table 10) showed that the three subgroups differed significantly, $F(2,165) = 49.08$; $p < .01$. The mean production scores of the low, average, and high nonverbal intelligence subgroups were 80.38, 96.54, and 108.03, respectively.

Table 10. Summary of production results for the three nonverbal intelligence (NI) subgroups

Group	N	Mean	F	p
Total Sample	168	95.79	49.08	<.01
Low NI	32	80.38		
Average NI	102	96.54		
High NI	34	108.03		

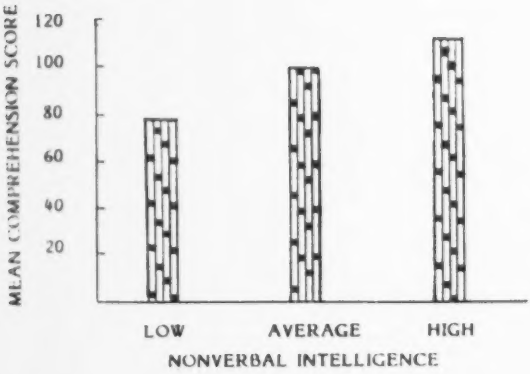

Figure 22. Mean comprehension scores of the low, average and high nonverbal intelligence sub-groups in the Indian sample

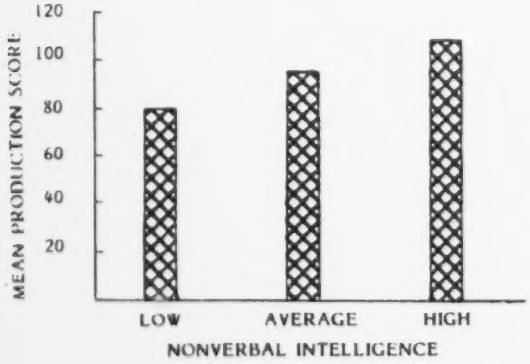

Figure 23. Mean production scores of the low, average and high nonverbal intelligence sub-groups in the Indian sample

3.2.2. Conceptual Level and Foreign Language Learning

Mean and standard deviation of the scores of conceptual level of the 168 Indian subjects were calculated. The mean was found to be 1.19 with a standard deviation of 0.46. The distribution of scores was broken up to generate three subgroups according to the cutoffs. Those subjects who scored 1 standard deviation below mean were taken as low in conceptual level; those who scored between mean ± 1 standard deviation were taken as average in conceptual level; and those who scored 1 standard deviation above mean were taken as high in conceptual level. Corresponding comprehension scores and production scores of each subject in the above three subgroups constituted the data for analysis under this section.

Comprehension

One-way ANOVA was carried out for the unequal groups on the comprehension scores of the three subgroups. A summary of the results is presented in Table 11. The three subgroups differed significantly on their comprehension scores, $F(2,165) = 21.94$; $p < .01$. The mean comprehension scores of the low, average, and high conceptual level subgroups were 82.67, 96.08, and 113.91 respectively (Fig. 24).

Table 11. Summary of comprehension results for the three conceptual level (CL) subgroups

Group	N	Mean	F	p
Total Sample	168	98.97	21.94	<.01
Low CL	9	82.67		
Average CL	125	96.08		
High CL	34	113.91		

The entire sample was broken up into males and females to test the significance of the sex factor on conceptual level. It was found, however, that the male and the female subjects did not differ significantly in conceptual level (see Table 16).

Production

Following the same criterion as used earlier the three subgroups formed were compared on the production scores. One-way ANOVA carried out for the unequal groups (Table 12) showed that the three subgroups differed significantly, $F(2,165) = 22.96$; $p < .01$. The mean production scores of the low, average, and high conceptual level groups were 80.89, 93.61, and 107.74, respectively (Fig. 25).

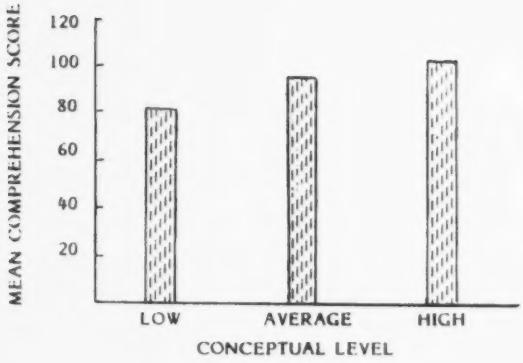

Figure 24. Mean comprehension scores of the low, average and high conceptual level sub-groups in the Indian sample

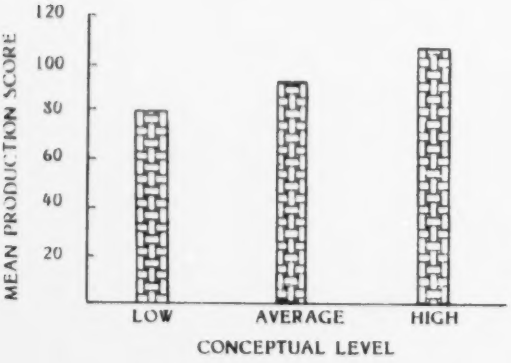

Figure 25. Mean production score of the low, average and high conceptual level sub-groups in the Indian sample

Table 12. Summary of production results for the three conceptual level (CL) subgroups

Group	N	Mean	F	p
Total Sample	168	95.79	22.96	<.01
Low CL	9	80.89		
Average CL	125	93.61		
High CL	34	107.74		

3.2.3. Regression Analysis

The data consisted of the comprehension and production scores on the foreign language test, nonverbal intelligence scores, and the conceptual level scores. The grades given at school in mother tongue, foreign language, and mathematics were also available, and were also included in the regression analysis. Stepwise multiple regression analysis was carried out on the obtained data taking comprehension and production as dependent variables with nonverbal intelligence, conceptual level, mother tongue, and mathematics, as independent variables. The summary of the results is presented in Tables 13 a & b and 14 a & b.

Table 13a. Summary of multiple regression analysis with the comprehension scores as dependent variable in the Indian sample

Variable	Multiple R	R^2	R^2 Change	Simple R	Beta
Mother Tongue	0.6596	0.4350	0.4350	0.6596	0.2608
Nonv. Int.	0.7178	0.5152	0.0802	0.6394	0.3358
Mathematics	0.7271	0.5286	0.0134	0.6267	0.2014
Conc. Level	0.7275	0.5293	0.0007	0.4827	0.3372

Table 13b. Percentage of variance accounted for predicting the comprehension scores of the subjects

Variable	% of Variance Accounted for	F	p
Mother Tongue	43.50	19.61	<.01
Nonverbal Int.	8.02	6.57	<.01
Mathematics	1.34	4.52	<.01
Conceptual Level	0.01	0.23	NS

The multiple regression analysis showed that mother tongue contributed significantly towards the comprehension scores of the subjects, $F(4,163) = 19.61$; $p < .01$. Percentage of variance accounted for by this variable in this respect

was 43.50. The contribution of nonverbal intelligence towards the comprehension scores was also significant, $F(4,163) = 6.57$; $p < .01$, the percentage of variance accounted for being 8.02. The contribution of mathematics grades was also found to be significant, $F(4,163) = 4.52$; $p < .05$, though its contribution in percentage was only 1.34. Conceptual level did not show any significance as far as its contribution to comprehension of the foreign language is concerned in the case of the Indian sample.

Table 14a. Summary of multiple regression analysis with the production scores as dependent variables in the Indian sample

Variable	Multiple R	R^2	R^2 Change	Simple R	Beta
Nonv. Int.	0.7132	0.5087	0.5087	0.7132	0.4352
Mathematics	0.7646	0.5846	0.0759	0.6375	0.2243
Conc. Level	0.7706	0.5939	0.0093	0.5556	0.1091
Mother Tongue	0.7737	0.5985	0.0047	0.6527	0.1294

Table 14b. Percentage of variance accounted for predicting the production scores of the subjects

Variable	% of Variance Accounted for	F	p
Nonverbal Int.	50.87	38.63	<.01
Mathematics	7.59	6.58	<.01
Conceptual Level	0.93	2.84	<.05
Mother Tongue	0.47	1.89	NS

The regression analysis carried out assuming production as the dependent variable showed that nonverbal intelligence contributed significantly towards production, $F(4,163) = 38.62$; $p < .01$, its percentage of contribution being 50.87. Mathematics grades also contributed significantly towards the production, $F(4,163) = 6.58$; $p < .01$. Its contribution in terms of percentage was 7.59. Conceptual level contributed significantly towards the production scores, $F(4,163) = 2.84$; $p < .05$. Its contribution in percentage was 0.93. It is interesting to note that while the contribution of mother tongue was highly significant (43.50 % approx.) towards the comprehension scores, it did not contribute significantly towards the production scores.

It is an important observation that nonverbal intelligence explained only about 8 % of the variance in the comprehension scores whereas it explained about 51 % of the variance in the production scores. The present results show a greater role of nonverbal intelligence in the process of production than in comprehension. These results are in consonance with the obtained results in the case of the Finnish sample.

In contrast to the Finnish findings, however, wherein mother tongue did not contribute significantly towards the comprehension of the foreign language, the Indian sample shows a highly significant contribution of mother tongue (Hindi) towards comprehension.

Moreover, in the case of the Finnish sample mother tongue contributed significantly towards the production (6.11 %) whereas it showed an insignificant contribution in the case of the Indian sample (0.47 %).

The correlation matrix generated for these variables is presented in Table 15.

Table 15. Intercorrelation between the different variables in the Indian sample

	Comp.	Prod.	F.L.T.	N.I.	Conc. Level	M.T.	F.L.G.	Math.
Comp.	-							
Prod.	.73**	-						
F.L.T.	.89**	.87**	-					
N.I.	.64**	.71**	.72**	-				
Conc. Level	.48*	.55**	.57**	.59**	-			
M.T.	.66*	.65**	.72**	.64**	.56**	-		
F.L.G.	.71**	.66**	.75**	.61**	.52**	.83**	-	
Math.	.63**	.64**	.68**	.58**	.50**	.82**	86**	-

* Significant at .05 level

** Significant at .01 level

The high correlation between the foreign language test scores and the foreign language grades (r_{tg} = .75) lends support to the validity of the foreign language test that was constructed by the investigator. The two parts of the test - comprehension and production - show similar relationship with the foreign language test scores and foreign language grades separately.

Table 16. Mean and standard deviation of the male and the female subjects (Indian sample) on different variables

	Maximum Score	Male (n=102) Mean	S.D.	Female (n=66) Mean	S.D.
Comp.	120	98.58	17.92	99.57	17.54
Prod.	120	95.65	14.12	96.00	14.71
F.L.T.	240	194.21	30.94	195.57	31.69
Nonv. Int.	60	38.80	8.14	39.04	7.52
Conc. Level	3	1.18	0.43	1.21	0.50
M.T.	100	62.12	10.36	63.35	12.09
F.L.G.	100	59.16	14.42	61.21	17.75
Math.	100	61.24	13.93	62.25	15.83

The overall results presented in this chapter show that - (a) subjects having high nonverbal intelligence show better comprehension and production in the foreign language, (b) subjects having higher conceptual level perform better on both comprehension and production tasks related to the second language, and (c) mother tongue and mathematics seem to be related with one's performance in a foreign language. The findings presented here are discussed in the next chapter.

4. DISCUSSION AND CONCLUSIONS

The findings of the present study provide support to the following broad conclusions:

1. Both the Finnish and the Indian subjects who scored higher on nonverbal intelligence as measured by Raven's Progressive Matrices Test, showed better comprehension of the foreign language than their respective counterpart group scoring low in nonverbal intelligence. It seems reasonable to assume that higher nonverbal intelligence facilitated their comprehension of the foreign language at least up to some level. The results obtained through regression analysis provide support to this conclusion. These results show that a comfortably significant amount of variance in the comprehension scores was due to the subjects' *inductive and analytical reasoning abilities*.

2. Subjects who scored higher on the nonverbal intelligence test also performed better in the production tasks (producing foreign language) than their counterparts as in 1 above. The ability of the subjects in their own mother tongue also seems to facilitate their performance of production in the foreign language. The outcome of regression analysis supports this observation.

3. Subjects showing greater structural complexity as measured by their high score on the conceptual level test, performed better on both comprehension and production tasks related to the foreign language.

Nonverbal Intelligence

The results indicate that a certain minimum of nonverbal intelligence is needed for a person to perform the necessary mental functions involved in learning a foreign language within the restricted time schedules of school curricula. Subjects feeling they do not reach a certain minimum level may also slow down the cognitive processes which are necessary to learn a foreign language; in other words, they may stop doing their best.

slow down the cognitive processes which are necessary to learn a foreign language; in other words, they may stop doing their best.

There is a general agreement that the language learning process involves the assimilation of information into existing cognitive structures, and that these cognitive structures set limits on the child's language development. The comprehension or interpretation process involves quite a few cognitive functions, e.g. speech perception, storage in the short term memory, organization of output, and long term memory. Lexical and syntactic processing at some minimum level are also necessary for the child to perform the interpretative task. The results of the present study show that the subjects having low non-verbal intelligence were not able to comprehend the foreign language as well as their counterparts could do. The present findings lend support to studies by Genesee & Hamayan (1980), Flahive (1980), and d'Anglejan & Renaud (1985).

In connection with the above observation one has to keep in mind, however, the nature of the comprehension test. It was made for children about twelve years old and consequently fairly easy, containing mostly concrete words and simple concepts. Supposing that a more difficult, abstract, comprehension test was constructed and given to older subjects, it might well be that the contribution of nonveral intelligence would be significant also for the group "above average" in comprehension. To test such a hypothesis, however, lies outside the range of this study, but it would no doubt be interesting. The hypothesis hinted at above seems to be in full accordance with the theory behind Raven's test. The nonverbal intelligence of a subject (in terms of progressive matrices scores) gives an idea of the capacity of the subject "to apprehend meaningless figures presented for his observation, see the relation between them, conceive the nature of the figure completing each system of the relation presented, and by doing so, develop a systematic method of reasoning" (Raven et al. 1983, 2). A high score on the nonverbal intelligence test should then indicate a subject's ability to perceive, rationally manipulate and discriminate images at an abstract level. Cognitive processes of the same kind are required in order to understand and produce a foreign language. The findings of the present investigation also suggest that the different processes involved in solving problems in the Raven's test are parallel to the processes required to learn a foreign language, but

cannot, as pointed out earlier, indicate whether the Raven's test has any prognostic value above a certain level.

Linguistic functioning is closely dependent on cognitive functioning (Bever 1970; Macnamara 1972; Sinclair-de-Zwart 1973). Foreign language learning is an active process in which the learner discovers how the input is segmented, how the segments are used to represent meaning, how units are assembled structurally, and what principles are used to achieve communicative goals. It involves a host of cognitive strategies and skills. Learning a foreign language involves internal representations that regulate and guide performance. These representations include procedures for selecting appropriate vocabulary, grammatical rules, and other conventions governing the language use. At the same time the learner tries to simplify and unify the internal representations in order to gain control over them. The higher nonverbal intelligence of the subjects indicates their ability to perceive, rationally manipulate, and discriminate images at an abstract level. Raven's problems require that the subjects detect a relationship between the elements of complex visual patterns, and then apply that relationship to complete a missing part of the pattern. A number of recent investigations suggest that such cognitive processes are very much required in order to understand and produce a foreign language. A high positive correlation between verbal and nonverbal intelligence and foreign language learning (both comprehension and production) lends support to many such studies (e.g., Oller & Perkins 1978a, b, c; Genesee 1976; Jensen 1969, 1980; Flahive 1980). These studies suggest that intelligence and language ability (to a certain extent) may in fact be the same thing. In some important experimental investigations, very small differences in information processing have been found between "high verbal" and "low verbal" subjects within the normal range of intelligence, but substantial differences were found when more extreme groups were studied (e.g. Hunt 1979). The results of many studies (e.g. Keele 1979) show relationship between information processing and general measure of (verbal) cognitive competence.

The findings of the present investigation, supported by other studies, seem to suggest that the different processes involved in solving a particular problem on Raven's test are parallel to the processes required to learn a foreign language.

As to what specific processes are involved in learning a foreign language, greater attention is required in order to search a functional relationship between nonverbal intelligence and foreign language reading.

Foreign language learning like other complex cognitive skills (e.g., required to score high on Raven's test) involves the gradual integration of sub-skills as controlled processes initially predominate, and then become automatic. It requires the assessment and coordination of information from a multitude of perceptual, cognitive, and social domains. The subject must learn to obey a large number of conversational conventions to begin with (McLaughlin 1987). Several researchers have dichotomized the processing capacity necessary for various mental operations. Either a task requires a large amount of processing capacity, or it proceeds automatically and demands little processing energy. In this context memory may be conceived as a large collection of nodes that become complexly interassociated through learning (Schiffrin & Schneider 1977). These nodes can be activated by either of the two processes - controlled processing and automatic processing. Controlled processing involves temporary activation of nodes in a sequence, and this activation is under attentional control of the subject. Controlled processes are capacity limited and require more time for their activation. Moreover, general intelligence seems to be related to attentional resources of the subject. Information processing involved in learning a foreign language requires the allocation of some attentional resources for its execution. If such resources are less than required (for a particular process), then that process may be able to function, but at a reduced level of efficiency. This seems to be true in the case of the learners who are low in nonverbal intelligence.

In this context, it might be assumed that word decoding is a slower process for a poor learner. Word code access is automatic for the good learner. Therefore, attentional capacity must be allocated to the decoding process for the poor learner. The use of attentional capacity for decoding, however, leaves less capacity for other processes, such as comprehension.

Paucity of attentional resources linked with lower nonverbal intelligence might then explain the poor performance of the subjects having lower nonverbal

intelligence. Even these subjects, however, could understand some of the message of the sentences given in the foreign language. This was quite expected, as these subjects possessed at least some level of reasoning ability, even though it was relatively low. This may be due to the ability of these subjects to use controlled processes which are relatively easy to set up, alter, and apply to novel situations. Why these subjects could not perform (in comprehension and production) up to the expected level requires further explanation.

Even if a subject is capable of adopting the controlled processing while learning the foreign language, his learning will be limited due to the fact that controlled processes are capacity-limited. In contrast, the automatic process utilizes a relatively permanent set of associative connections in long-term capacity free storage. Like any other complex cognitive skill, foreign language learning involves building up a set of well-learned, automatic procedures so that controlled processes will be freed for new tasks. Despite the fact that the subjects having lower nonverbal intelligence can understand some simple words, and communicate in terms of words, phrases and broken or grammatically incorrect sentences, they quite often seem to fail to comprehend the full structure of the sentences, and cannot communicate in terms of grammatically correct sentences. It seems that in the case of poor learners the controlled process is not fully replaced by the automatic process. This results in a kind of plateau formation in learning the foreign language.

Subjects low in nonverbal intelligence seem to lack the ability to manipulate and integrate the internal representations of the message which is necessary for successful automatic processing. On the other hand, subjects high in nonverbal intelligence can efficiently manipulate and integrate the information reflecting their superior ability to adopt automaticity. Such an explanation is strengthened by the findings reported by Nation & McLaughlin (1986). Multilingual subjects performed better than monolingual subjects in learning a miniature linguistic system under implicit conditions. Multilingual subjects may then be superior to other language learners in organizing linguistic stimuli because of superior automatic processing skills.

Due to successful transition from controlled processing to automatic processing, subjects high in nonverbal intelligence seem to require less efforts in comprehending and producing the sentences of a foreign language, whereas subjects low in nonverbal intelligence do not seem to be successful in adopting a more efficient and capacity-free process of automaticity. This may be due to lack of some kind of "mediating pin" that presumably is provided through reasoning ability. Less advanced learners do not seem to have automatized formal aspects of the language, and so have less cognitive energy available for the semantic aspect (McLaughlin 1987). Jensen (1979) supports this argument on the basis of his findings that in extreme group designs, those groups that score high on intelligence tests, have faster choice reaction time.

To what extent nonverbal intelligence may be considered as a source of such cognitive energy may not be answered directly and requires further exploration. It seems plausible, however, to assume that nonverbal intelligence encompasses a large number of operations that are also involved in learning a foreign language. Apparently, the mental operations involved in foreign language learning seem to be facilitated by nonverbal intelligence up to the level it (nonverbal intelligence) is required for adopting automaticity of the cognitive functioning. Beyond such an optimum level, however, nonverbal intelligence does not seem to effect the process of foreign language learning.

The results of the present investigation also show that in general, the production scores of the subjects were lower than their comprehension scores. The detailed analysis of the data indicated that a low nonverbal intelligence group showed their poor ability to produce the sentences in the foreign language, and in comparison with their comprehension, production was weaker. Production involves all the processing capacities required in comprehension as well as restructuring, organizing, and motoring output processes. Earlier studies indicate that production usually lags behind comprehension (e.g. McLaughlin 1978). This is probably because the subject must learn to organize sentence output, especially in terms of word order and syntax. Logically, the production process requires much more cognitive energy and an efficient mode of sentence processing like automatic processing. Successful production strategies involve planning strategies and monitoring. Poor performers rely on semantic

simplification and the omission of form words and affixes. These subjects, already unable to cope with the relatively simpler processes involved in comprehending the foreign language, are naturally expected to be further handicapped in the production process, due to the increased complexity.

Conceptual Level

The results show that a positive answer can be given also to the second question that was formulated beforehand. Subjects having lower conceptual level were poorer in both comprehension and production of the foreign language than those having average or high conceptual level. Subjects showing greater structural complexity, as measured by their higher scores on the conceptual level test, performed better than their lower-scoring counterparts.

It seems reasonable to suppose that the conceptual level test, too, is easier for subjects with a high reasoning ability, and on that basis to conclude that it strengthens the results given by the Raven's Progressive Matrices test. According to Hunt and Sullivan (1974) a child who has a higher CL-score than others of his own age will be able to perform tasks where complexity in information processing is involved, whereas a child with a low CL-score will not be able to perform such tasks efficiently. In other words, a person having higher conceptual level should be able to discriminate, integrate, and differentiate the information more effectively than a person low in conceptual level. For these reasons it was assumed that children poor in a foreign language are also poor in conceptual level. The results of the present study give support to this assumption. Students showing low conceptual level may perform poorly on foreign language learning tasks because certain mediatory conceptual processes might be missing or be weak in their processing systems. On the other hand, high conceptual level may be assumed to be positively related to effective processing in foreign language tasks.

The results also give support to earlier findings (Hunt and Sullivan 1974; Hunt et. al. 1978) according to which conceptual level measured with the PCM-test is related to IQ/ability/achievement, but is distinct from those. The

correlation between the nonverbal intelligence scores and the conceptual level scores was positive but moderate. This may be connected with the interpersonal immaturity-side measured by the PCM-test. A person may possess a high reasoning ability needed for solving problems, and yet, due to immaturity in personal relationships, try to solve problems with for instance aggressiveness. The results support the assumption that a child learning foreign languages must possess both fairly good information processing abilities and emotional stability. Poor self - others relationship might spoil the learning outcome. Hunt and Sullivan (1974) point out that a person at a higher conceptual level is more structurally complex, more capable of responsive actions, and more capable of adapting to a changing environment than a person at a lower conceptual level. It is important to be aware that the two tests (Progressive Matrices and the PCM-test) do not always give the same results. If we are to assume that there is a connection between a subject's result in the nonverbal intelligence test and his ability to learn a foreign language under school conditions, Raven's test can be given a certain prognostic value. When a student, however, scores high on Raven's test but turns out to have a low conceptual level score, and has poor results in the foreign language test, we should start looking for other causes than lack of reasoning abilities. Here lies the reason for applying both Raven's and Hunt's tests.

Of special interest is that the regression analysis showed conceptual level to be a significant predictor for the Finnish sample both in the comprehension and the production tasks of the foreign language, while for the Indian sample only the contribution to the production scores was significant. Also for the production its contribution was less than for the Finnish sample. This may be due to cultural differences. The mean of the conceptual level scores was much higher for the Indian sample. It is possible that Indian children of this age do not behave as aggressively as children in the Nordic countries, where lots of children have been found to be maladjusted in the present comprehensive schools. In addition, Nordic children are possibly allowed more freedom and aggressiveness at home.

The results discussed above raise some questions for further study. Firstly, is it possible to separate from the conceptual level test those tasks that mainly

measure interpersonal maturity? If the answer is positive, then it might be possible with the help of this easy, short test to find out when a child is suffering from a learning disability mainly due to affective factors (in cases where the intelligence-test score is good). If also the emotional maturity seems to be good, then again one might try to look for other factors behind the learning disability, for instance dyslexia. Thus a short, simple test could serve as a base for getting closer to the causes of a child's learning disability. The nonverbal intelligence test could tell whether a child has the reasoning abilities needed for foreign language learning within the restricted time schedules of school curricula, and the PCM-test could possibly tell if special linguistic or emotional disturbances lie behind the non-learning. These are questions that cannot be answered on the basis of the present study. The results, however, strongly indicate that the tests concerned can be useful for these purposes.

Sex Differences

As for the question whether sex is an important factor in foreign language learning at elementary school level, it is not possible to give an answer that goes for both the Finnish and Indian sample. In the *Finnish* sample there was a significant difference between the male and female subjects in both language tests. The girls were significantly better than the boys both in the comprehension part and the production part. In the Finnish sample the girls also showed higher nonverbal intelligence than the boys. Also in conceptual level the Finnish girls were better than the boys. The differences were statistically significant.

In the *Indian* sample there were no significant differences between the male and female subjects in the foreign language tests. Nor were there significant differences between the sexes in nonverbal intelligence or conceptual level.

There may be several explanations for the differences. The least complex one for the sex differences would be to assume that girls at this age are on the whole more mature than boys. This would not, however, seem to be a good enough explanation, as a corresponding difference is not found in the Indian sample.

Another explanation would be to assume that the sex roles in the western culture are responsible for the differences. If one is to suppose that boys try to behave like their fathers and girls like their mothers, there are some facts that seem to give strength to this assumption. It is a statistically proven fact that in the Nordic countries women read more literature (fiction) than men do, and talk more about what they read, perhaps in this way making it seem important and interesting to their daughters. Women also generally talk more. Men are supposed to be *doing* things rather than talk about them. If boys are with their fathers at football matches, washing the car, perhaps out fishing or hunting, it might go a long way towards explaining the differences between boys and girls simply as a result of different stimuli and attitudes.

Different attitudes may also reflect the fact that boys in Finland do not as a rule obtain a high status among their friends by being good pupils and getting good grades. It seems true that girls have a more positive attitude to school work, especially to learning languages, that they work harder and generally have a higher verbal capacity.

In the Indian sample no similar differences between male and female subjects were found in this study. To find an explanation it seems to be most sensible to start looking for factors that are related to the different cultures of the two countries.

One may assume that the cultural background of the Indian subjects differs from the Finnish in the sense that the respect for learning and literature is, on the whole, greater in India than in Finland. It seems improbable that sex roles in India should be less strong than in Finland, so, if Indian boys try to be like their fathers, it ought to mean that these are less orientated towards active, practical ways of using their free time than are their Finnish counterparts.

Another explanation, which is also related to the cultural background, is that maybe Indian boys somehow learn the hard facts of life earlier than Finnish boys do. One may assume that Indian boys very early are made aware that working hard at school is necessary. They probably know their parents are making sacrifices in order to give them a good education and therefore feel a

responsibility to do their best. They probably also know early how important a good education is.

At last, one can assume that schoolboys in India are more influenced by their *parents* than their counterparts in Finland. In the latter country one can safely talk about a youth culture or perhaps even child culture, where especially boys early are more susceptible to what their *comrades* think than to what their parents think. This is also a consistent research finding. Maybe the answer simply is that Indian parents can still influence their sons more actively than Finnish parents can.

These attempts to explain some interesting differences between the samples are little more than speculations. To be on safer ground it would be necessary to find out what sociological research has been done in this field and extract what might be of relevance. Although the differences between the Indian and the Finnish samples are not directly of importance in relation to the purpose of this study, they certainly deserve to be studied further.

Intelligence tests are constructed so that there will be no overall sex differences in intelligence. The results in the Indian sample are in full accordance with this. The Finnish females, however, scored significantly higher in nonverbal intelligence than the corresponding male subjects. This finding should definitely not be interpreted so that Finnish women are more intelligent than men. We must keep in mind that the Raven's Progressive Matrices test was given to elementary school pupils, of the age 12-13 years. At that age all the boys and girls still study the same amount of mathematics, a subject supposed to develop reasoning abilities. In addition, Finnish girls have been found to be more conscientious in their school work in general and read more than boys. At that age it may therefore be possible that Finnish girls generally score higher than boys in tests measuring reasoning abilities. Later, boys more often than girls choose streams including more mathematics and physics as well and show more competitiveness, which, taken together, might develop the reasoning abilities of the boys. On the basis of the present study, however, it is not possible to answer the question why the Finnish girls performed better than the boys in the nonverbal intelligence test.

What was said about sex differences in nonverbal intelligence also applies to the results in the conceptual level test. Only in addition comes an assumption that girls in Finland may be mentally more mature, have better interpersonal relations than boys. As discussed earlier, the sex differences may also partly be due to this. In fact, boys have repeatedly in different countries been found to be more aggressive than girls (see the research review in Maccoby and Jacklin, 1974).

To what extent the sex differences found in the present study support earlier research findings is not an easy question to answer, simply because the literature on sex differences in cognitive abilities is filled with contradictory theories, and even emotional claims unsupported by any research done in the field. It is, however, clearly documented that there exist real sex differences with respect to some cognitive abilities. (For an extensive research review see Halpern, 1986.) There is also some evidence that biological sex differences play a role in cognitive abilities, especially when learning disability is concerned (Geschwind and Behan 1982; Galaburda et al. 1983; Galaburda 1984). When measuring cognitive abilities we also have to remember the fact that very often the tests measure achievement as well. We can hardly ever be sure when the differences found are really sex differences in ability and not in achievement. There is, however, considerable agreement about which of the cognitive abilities differ by sex. Consistent sex differences have been found in visual-spatial, quantitative and verbal abilities. Sex differences have been found to be largest in spatial tasks and least in verbal tasks. The differences in spatial abilities have been most frequently studied, those in verbal abilities least. Yet verbal sex differences have been found to be the first to appear, numerous studies documenting sex-related verbal differences beginning at age 11 (Maccoby and Jacklin 1974; Halpern 1986). Verbal abilities and foreign language learning will be discussed more in detail under mother tongue/mathematics.

Mother Tongue and Mathematics

It has been pointed out that research done on the relationship between mother tongue learning and foreign language learning in schools is scarce. What

little research has been done suggests, however, that there is a fairly close relationship between the two types of language learning. (See Genesee 1976; Takala 1977; Genesee & Hamayan 1980; Syngle 1981; Sarmavuori 1983.)

The question "Is there a relationship between foreign language learning and mother tongue learning?" must be answered separately for the two samples, as interesting differences emerged between the Indian and the Finnish sample. In the Finnish sample, Mother tongue I contributed significantly towards the production score. (The grade in Mother tongue I is based on reading, grammar and literature, in Mother tongue II on fluency in oral and written work.) As for the comprehension score, neither Mother tongue I nor II contributed significantly. In the case of the Indian sample, however, Mother tongue contributed significantly towards the comprehension score, but *not* towards the production score. (In the Indian schools concerned only one grade is given in Mother tongue.)

In order to explain this difference, it would be necessary to know more about on what grounds the grades in Mother tongue are given in Indian and Finnish schools respectively. In the Finnish sample Mother tongue I contributed significantly towards the production score. This seems reasonable, as grammar weighs heavily in Mother tongue I. It may be assumed that those pupils who understand and can apply the grammatical rules of their mother tongue will have an advantage when it comes to producing a foreign language.

In the Indian sample, on the other hand, Mother tongue contributed significantly towards the comprehension score. To find out why, it might be useful to know more in detail on what basis Indian teachers give the grades in Mother tongue. Could it for instance be that Indian pupils are used to analyzing texts more deeply to find the real contents? If they have more training in this than their Finnish counterparts, it might explain why Mother tongue contributed significantly towards the comprehension score only in the Indian sample. This question cannot, however, be answered without further research. Here it can only be concluded that the grades in Mother tongue need not have the same basis in the two samples.

Whatever the case may be, there exists some literature that suggests relationship between mother tongue and second language. When learning a second language, the child does not have to build up knowledge of the world and language from a vacuum. If one views language learning in terms of processes involved and in terms of strategies used in learning language, the similarities between first and second (language) learning become more pronounced. According to many researchers, including McLaughlin (1978, 1987), there are certain similarities between the processes and operations involved in both. The contention that the process of second language learning is developmentally like first language learning, is also strongly supported by Ervin-Tripp (1974). Early sentences in the second language are similar in their function, their form, their semantic redundance, their reliance on short term storage to those of the first language. In this context McLaughlin (1978) argues further that there is a single language acquisition system that is utilized in first and second language acquisition at all ages, that the individual's languages are stored together in one memory 'tank', and that there are mechanisms at the retrieval stage for keeping the languages separate in output.

As for Mathematics, it is interesting to observe that in the Indian sample Mathematics contributed significantly towards both the comprehension and the production scores, but in the Finnish sample it was not significant at all. At least two questions arise. Just as for Mother tongue grades, it seems reasonable to start with the question: Do grades express the same in both samples? The teaching of mathematics in Finnish schools has been criticized for not training the pupils' analytical capacities sufficiently. If this criticism is correct, whereas it might not be true of the teaching in Indian schools, one would think an explanation were to be looked for in this field.

Another aspect worth considering is that the Indian pupils concerned had started school at the age of five, two years earlier than their Finnish counterparts. Maybe their analytical abilities had therefore been more developed both in mathematics and mother tongue, and that this could explain that the prognostic values of the grades differ.

Conclusions

It now seems possible to draw the conclusion that there is a connection between the nonverbal intelligence of a subject and his ability to learn a foreign language under usual school conditions. This seems to be true independently of the learner's mother tongue, the language taught, and cultural background, as it comes out clearly both in the Indian and the Finnish sample, and for both sexes. The findings of the present investigation thus suggest that the different processes involved in solving problems on the Raven's test, i.e., analytical and inductive reasoning, are to a certain degree parallel to the processes required in learning a foreign language. The nonverbal intelligence of the subjects indicates their ability to perceive, rationally manipulate and discriminate images at an abstract level, also in language learning. The results of the present study support the findings by Genesee & Hamayan (1980), Flahive (1980), and d'Anglejan & Renaud (1985). Their findings were, however, either based on very small samples or dealt with adult students. The relationship between different predictors and teachers' grades given in several subjects to very young pupils, 10-11 years old, has been studied by Patjas (1976). She found Raven's test to be the best predictor in foreign languages as well as in some other subjects. Also her findings are supported by the present study.

On the basis of this study and earlier research, it may be assumed that the prognostic value of the nonverbal intelligence test can be trusted at least up to a certain level. In other words, one may be fairly sure that subjects scoring very low on this test will not stand much chance of learning a foreign language with the methods and within the time at disposal in a typical school situation. If the objective is that all pupils should learn a foreign language, only very concrete vocabulary and simple communication should probably be demanded of the poorest performers.

What has been called nonverbal intelligence is not necessarily nonverbal, as it seems that both nonverbal and verbal intelligence tests partly measure the same ability (e.g. Oller & Perkins 1978a, b, c; Genesee 1976; Genesee & Hamayan 1980; Jensen 1969, 1980; Flahive 1980; Oller 1978; 1979, 1980; Stump 1978; Streiff 1978; Olson 1986). These studies suggest that intelligence and lan-

guage ability to a certain extent may in fact be the same thing. If this is a fact it does not, however, in any way make the Raven's Test less valuable, simply because it can be used all over the world without regard to the subject's mother tongue. It must always be remembered, however, that some pupils will never be able to profit satisfactorily from language teaching because they suffer from some emotional or neurological handicap, such as dyslexia. In such cases a nonverbal test of reasoning cannot be a reliable predictor.

5. SUMMARY, LIMITATIONS, AND SUGGESTIONS FOR FURTHER RESEARCH

5.1. Summary

In quite a few countries children at elementary school level have to study not only one but two or more languages as compulsory subjects. Very frequently it is observed that some students are not able to learn the language/s successfully. In order to solve this problem many countries, e.g., Sweden, Norway, and Finland introduced different kinds of streaming systems, but not with much success. In Finland, all children have to study at least two languages in addition to their mother tongue. One of these languages has to be Swedish, and the other language is usually English. In India, school (Central) children start learning English, Hindi, and/or their local language from the very beginning (grade 1, age 5).

Research on poor foreign language learning outcome is scarce. We still know very little about mental processes behind good and poor foreign language learning. Foreign language learning can be assumed to be connected with a person's verbal intelligence. For remedial purposes, however, it is not of great value to find out that a pupil who is poor in foreign language is also poorer than his classmates in verbal intelligence. This would be only what is expected.

The present study is concerned with children attending ordinary school classes, children who have been considered to meet the requirements of general intelligence. If this were not the case, they would have been sent to special classes years ago.

The main objectives of the present research were: (a) to study and analyze the relationship between nonverbal intelligence and foreign language learning, (b) to study and analyze the relationship between conceptual level and foreign language learning, and (c) to study and analyze the relationship between foreign and mother tongue, and mathematics. In the present study, foreign language refers to any non-native language that is learnt after the primary language. As foreign languages English and Swedish were chosen in Finland, English in India.

Method

The total sample for the present study consisted of 768 subjects, 600 from Finland and 168 from India. Out of 600 Finnish subjects, 321 were male and 279 were female. Out of 168 Indian subjects 102 were male and 66 were female. The age of the subjects ranged from 12 to 13 years. All the Finnish subjects spoke Finnish as their mother tongue, and were studying English (n = 352) or Swedish (n = 248) as their first foreign language. The Finnish sample was taken from ten schools in Helsinki on the basis of stratified sampling. The schools picked for the sample represented all social classes approximately in the same proportion as they appear in the city concerned. The Indian sample was taken from four central schools in Delhi, because children going to these schools presumably come from a relatively homogenous socio-economic background.

It is important to note here that the objective of the present study was not to make a cross-cultural comparison; rather, it was to investigate whether the same mental processes are involved in poor and good language learning, regardless of the subjects' mother tongue and cultural background.

The tests used in the study were: (a) foreign language test, (b) Raven's Progressive Matrices test (Raven 1983), and (c) Paragraph Completion Method test (Hunt et al. 1977). The subjects' scores on Raven's Progressive Matrices test provided an index for their nonverbal intelligence. The Paragraph Completion Method test was used to assess the conceptual level of the subjects. In this test the completion responses are considered to reflect how a person thinks, and it also measures the interpersonal maturity (of the person) as indicated by self-defining and self-others relations. The foreign language test was developed by the investigator herself as there were no standard foreign language tests available that could have been suitably employed for the present study. The test measured subjects' comprehension of the target language in communicative everyday situations as well as their ability to produce understandable language in similar situations. Simple everyday conversational speech was presented in written form. The test consisted of two main parts: (a) comprehension and (b) production. Both parts contained several sections. The reliability and validity of the test were found to be satisfactory.

A pilot study was conducted on 57 subjects - 29 boys and 28 girls. The main study was carried out in Finland and India during the same term. In India, an experienced researcher in psychology was trained in advance for testing the pupils. The text itself and the content of all the different subsections were considered to be suitable for the Finnish as well as for the Indian sample. During the conduction of the study, Raven's Progressive Matrices test and Hunt's Paragraph Completion Method test were given first. The foreign language test was administered some time later. A time interval was necessary because of the length of the tests. All the tests were administered in groups (of classes), and the pupils were encouraged to ask questions whenever there was something in the instructions that they could not understand. The investigator walked about from pupil to pupil during the test in order to check that everybody really had understood what was to be done. While receiving the papers, the investigator checked that everything was properly done.

The obtained data consisted of the comprehension and the production scores, nonverbal intelligence scores, and the conceptual level scores. The school grades (of the recent examinations) of the pupils were taken on three subjects - foreign language, mother tongue, and mathematics. The analysis of the data was carried out separately for the Finnish and the Indian subjects.

Results

The Finnish sample

The statistical analysis of the data was carried out using analysis of variance, t-test, correlations, and regression analysis. Three subgroups of varying nonverbal intelligence (low, average, and high) were generated on the basis of Mean ± one Standard Deviation criterion. The results showed that in the case of the Finnish sample, the three subgroups of subjects (low, average, and high) differed significantly in their comprehension of the foreign language, $F(2,597) = 38.63$; $p < .01$. The subjects having higher nonverbal intelligence showed better comprehension of the foreign language. Similar results were found for the male and female Finnish subjects. The female subjects, however, showed significantly higher nonverbal intelligence than the male subjects ($t = 3.57$; $p < .01$). The

three subgroups (low, average, and high) formed on the basis of their nonverbal intelligence also differed in their production scores significantly, $F(2,597) = 107.77$; $p < .01$. The subjects having high nonverbal intelligence showed better production on the foreign language test. This was found to be true for both the male and the female children in the Finnish sample.

Three subgroups of varying conceptual level (low, average, and high) from the total sample were also generated. The comprehension and production scores were subjected to one-way ANOVA. It was found that the three subgroups differed significantly on their comprehension scores, $F(2,597) = 15.40$; $p < .01$. The subjects having higher conceptual level showed better comprehension of the foreign language. The same trend was found in the case of both the male and the female samples. The female subjects, however, showed significantly higher conceptual level than the male subjects ($t = 10.00$; $p < .01$). The three subgroups (low, average, and high) formed on the basis of their conceptual level also differed in their production scores significantly, $F(2,597) = 52.84$; $p < .01$. Similar results were obtained in the case of both male and female subjects.

Multiple regression analysis applied on the data of the Finnish sample showed that nonverbal intelligence contributed significantly towards the comprehension scores of the subjects, $F(5,594) = 29.86$, $p < .01$. It accounted for 14.99 % of the variance in the comprehension scores. The contribution of conceptual level towards the comprehension scores was also significant, $F(5,594) = 3.84$; $p < .01$. Its percentage of variance accounted for comprehension was 1.05.

Nonverbal intelligence contributed significantly towards production, $F(5,594) = 111.76$; $p < .01$. Its percentage of contribution was 43.95. Mother tongue I also contributed significantly towards production, $F(5,594) = 18.94$; $p < .01$. Its percentage of contribution was 6.11. Conceptual level was also found to contribute significantly towards production, $F(5,594) = 6.69$; $p < .01$. Its percentage of contribution was 0.90.

The results also showed significant and positive correlation between - (i) foreign language test scores and the foreign grades, i.e., .71; (ii) comprehension

and foreign language test, i.e., .44; (iii) comprehension and foreign language grade, i.e., .45; (iv) production and foreign language test, i.e., .79; (v) production and foreign language grade, .74.

The Indian Sample

The data obtained on the Indian sample were analyzed in the same way as the data obtained on the Finnish sample. The results showed that in the case of the Indian sample, the three subgroups of subjects (low, average, and high on nonverbal intelligence) differed significantly on their comprehension of the foreign language, $F(2,165) = 47.65$; $p < .01$. The three subgroups also differed significantly on their production scores, $F(2,165) = 49.08$; $p < .01$. The subjects having higher nonverbal intelligence showed better comprehension of the foreign language, and they were able to produce better on the foreign language test.

The three subgroups of the subjects (low, average, and high on conceptual level) differed significantly on their comprehension scores, $F(2,165) = 21.94$; $p < .01$. They also differed significantly on their production scores, $F(2,165) = 22.96$; $p < .01$. The subjects having higher conceptual level showed better comprehension of the foreign language and they were able to produce better on the foreign language test.

Multiple regression analysis applied on the data of the Indian sample showed that mother tongue contributed significantly towards the comprehension scores, $F(4,163) = 19.61$; $p < .01$. Percentage of variance accounted towards comprehension was 43.50. The contribution of nonverbal intelligence towards comprehension was also significant, $F(4,163) = 6.57$; $p < .01$. The contribution of mathematics grades was also found to be significant, $F(4,163) = 4.52$; $p < .05$. The percentage of variance of nonverbal intelligence and mathematics towards comprehension scores was 8.02 and 1.34 respectively.

Nonverbal intelligence contributed significantly towards production scores, $F(4,163) = 38.62$; $p < .01$. Mathematics grades also contributed significantly towards production scores, $F(4,163) = 6.58$; $p < .05$. The contribution of

conceptual level towards production scores was also significant, $F(4,163) = 2.84$; $p < .05$.

The obtained results show that nonverbal intelligence explained only 8 % of the variance in the comprehension scores whereas it explained about 51 % of the variance in the production scores. The present results show a greater role of nonverbal intelligence in the process of production than in comprehension. These results are in consonance with the results obtained on the Finnish sample.

Discussion

It seems that due to successful transition from controlled processing to automatic processing in the subjects having high nonverbal intelligence, they require less efforts in comprehending and producing a foreign language. On the other hand, subjects low in nonverbal intelligence do not seem to be successful in adapting a more efficient and capacity free process of automation.

The present findings also show that subjects having lower conceptual level were poorer in both comprehension and production of the foreign language than the ones having average or high conceptual level. The results support the earlier findings (Hunt & Sullivan 1974; Hunt et al. 1978), according to which conceptual level measured with the PCM-test is related to IQ/ability/achievement but is distinct from those. A person may possess a high reasoning ability needed for solving problems, and yet, due to immaturity in personal relationships try to solve problems with for instance aggressiveness. The results support the assumption that a child learning foreign languages must possess both fairly good information processing abilities and emotional stability. Poor self-others relationship might spoil the learning outcome.

In the Finnish sample mother tongue I contributed significantly towards the production score. This seems reasonable, as grammar weighs heavily in mother tongue I. It may be assumed that those pupils who understand and can apply the grammatical rules of their mother tongue will have an advantage when it comes to producing a foreign language.

As to why mother tongue contributed significantly towards the comprehension scores only in the Indian sample, further research is required. Here it can duly be concluded that grades in mother tongue need not have the same basis in the two samples. Contribution of mathematics towards comprehension and production scores in the case of the Indian subjects and not for the Finnish subjects also needs to be explained in later research.

5.2. Limitations

It is important to bear in mind that the purpose of this study was *not* to find out how much pupils in India and Finland had learnt, but to study the relationship between foreign language learning outcome and certain cognitive and background factors. Apart from that, however, there are some limitations one must be aware of when conclusions are drawn.

In the Finnish sample, the whole age group is included. All pupils in a district go to the same comprehensive schools, private schools are very nearly non-existent. The Indian sample consists of pupils from one type of school, Central schools, and does not represent the whole age group in their respective districts.

Then, background factors that may be important have not been taken into consideration. Here it is for instance natural to think of teaching conditions. It turned out that while the Finnish pupils had few lessons, but were taught in small groups, the Indian pupils had more lessons, but were taught in large classes. One should also mention that the Indian teachers did not have at their disposal much audio-visual aids, while Finnish teachers had them in abundance.

Another factor that was not considered was the general atmosphere of the schools. It struck the experimenter that the pupils in the Indian schools showed good discipline not only in the classes but also during the breaks. At home they spend a lot of time with grownups. It would be natural to assume that this difference influences the learning outcome.

The limitations mentioned above probably do not influence the findings greatly. There can be little doubt that the findings are interesting and important enough to serve as a basis for further research.

5.3. Suggestions for Further Research

It seems to be generally agreed that the resources of the human brain are likely to become more and more important in every country. Therefore, it must be considered equally important to develop the mental capacity of all, whether they are found to be average, below or above average. It seems obvious, then, that further research ought to be done on the relationship between nonverbal reasoning and foreign language learning. As was pointed out in the discussion part, one can draw no certain conclusions about the "above average" group in this respect. To find an answer, further research would have to concentrate on foreign language learning at a more complex level than in the present study.

We also discussed possible factors behind the interesting differences that were found to exist between the Indian and the Finnish sample. It was admitted, however, that the discussion could be little more than speculations. It would be of great value to have the differences confirmed by further research, and to establish the factors behind them. Then one might for instance learn why both Indian girls and boys in a certain age group seemed to use their mental capacity equally well, while in Finland the girls were superior to the boys. Then one might be able to suggest possible improvements in the Finnish school system.

It would not be enough to think of further research only in terms of India and Finland. In fact, satisfactory answers to the questions raised in the discussion part can only be found through research projects on a much larger scale. Other countries than India and Finland would have to be included, preferably in many parts of the world and with different political systems.

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